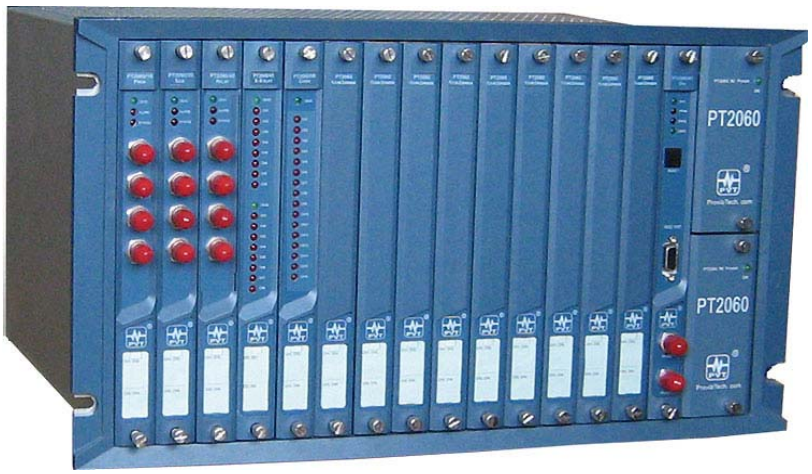
PT2060 Monitor

PT2060/10 PROX Proximity Module

User Manual

Installation, Operation, Maintenance



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Contents

Receiving Inspection and Handling Guide

Inspection

Check the devices for possible damage that may have occurred from improper transport. Damages in transit must be recorded on the transport documents. All claims for damages must be claimed without delay against the shipper and before the installation.

Handling and Storing Considerations

PT2060 should be handled with care during unpacking and installation. Damage to PT2060 is typically caused by rough handling, shock, or electrostatic discharge (ESD).

Be aware of the following precautions when unpacking and handling PT2060 rack or any module.

- ✓ Please have attention about the sharp corners/sides of the rack to avoid any of injuries during the installation, transporting and un-installation.
- ✓ All circuit boards and electronic modules associated with this rack contain components which are susceptible to damage caused by electrostatic discharge. It should be necessary to discharge any static electricity from yourself and your clothing before handling the rack.
- ✓ Whenever the module is not installed in a system, always keep it in the protective antistatic bag.

PT2060/10 Module Introduction

General Information

ProvibTech's PT2060/10 PROX proximity module is a four channel proximity signal conditioner, and processing unit. This module should be assembled in the PT2060 rack to fulfill its function. The *PT2060 System Configuration* software is used to configure the module's type, and set its parameters and display information including active value.

Figure 1

Each channel on the PT2060/10 PROX proximity module can accept any proximity probe system signal input, process it, and output the processed data. The *PT2060 System Configuration* software performs the configuration of parameters for the PT2060/10 PROX module, and collects information on module including proportional value and GAP voltage.

Note: For **speed** measurement, optional magnetic pickup sensor is available.

PT2060/10 PROX proximity module can realize the following functions:

- ✓ Shaft Radial Vibration **(4 channels)**
- ✓ Axial Thrust Position **(4 channels)**
- ✓ Differential Expansion **(4 channels)**
- ✓ Eccentricity **(2 channels)**
- ✓ Low Frequency Vibration **(4 channels)**
- ✓ Speed output **(2 channels)**
- ✓ Zero speed and speed **(2 channels)**
- ✓ Reverse rotational protection output **(2 channels)**

Shaft Radial Vibration

For rotating machinery monitoring, radial vibration is one of the fundamental parameters of indication machine running status. Many machine malfunctions, such as rotor imbalance, misalignment, bearing wear, shaft cracks and shaft rubs may cause significant vibration change.

Axial Thrust Position

Axial thrust position is the most important monitored parameters on many machines including steam, gas and hydro turbines, centrifugal and axial compressors, and centrifugal pumps. Excessive axial thrust position movement can lead to extensive machine damage.

The PT2060/10 PROX proximity module provides early warning of thrust bearing failure. While accepting inputs from proximity probe transducer systems, it continuously measures and monitors one to four independent channels of axial shaft position relative to the axial clearances within the machine. It is recommended to mount two probes to measure shaft position. This will maximize the reliability of shaft position measurement.

Differential Expansion

In turbine machinery monitoring, differential expansion is one of the important factors in machine running status indication. The excessive thermo expansion of the rotor and the stator may cause machine failure. PT2060/10 PROX proximity module can be configured to measure turbine thermo differential expansion.

Eccentricity

Eccentricity is very important for monitoring turbine rotor bow. PT2060/10 PROX proximity module can provide sophisticated on-line eccentricity monitoring. The monitor is suitable for virtually all types of rotating machinery in terms of eccentricity. The PT2060/10 PROX proximity module will be continuously measure and monitoring in up to two channels per module.

Eccentricity measurements indicate the deviation of the rotor physical center and the theoretical center. The difference has to be small enough to allow machine startup without causing damage. The PT2060/10 PROX proximity module provides peak-to-peak eccentricity measurement, which measure the difference between the positive and the negative extremes of the rotor bow. It also has one more channel that output the position of the rotor.

⚠ **Warning**
To measure eccentricity, phase reference channel must be available.

Low Frequency Vibration/Hydro Vibration

This is a general channel to measure low frequency vibration. This mode is applied whenever phase reference is not available.

Possible application includes hydro-turbine oscillation. Hydro turbine shaft oscillation is usually a low frequency oscillation. Excessive oscillation will damage the turbine.

Speed, Reverse Rotation Speed Output and Zero Speed

Rotor speed is important measurements during normal machine operating conditions as well as during startup and coast down. Sudden unexpected changes in rotor speed may be an indication of machinery or process malfunction.

Many machines require a turning gear be used to prevent rotor bow while the machine is off-line. It is essential that the rotor speed of operation has dropped to a specified value, which is zero speed. PT2060/10 PROX proximity module continuously measures shaft speed, and zero speed indication.

Zero speed will have two output channels. It will include both zero speed and speed measurement.

For some machine, reverse rotation will damage the machine. PT2060/10 has option to configure the module to reverse rotation monitor. This mode requires two sensors for one channel. The reverse rotation monitor will output alarms for machine reverse rotation, it also include all the function of the speed channel.

Triple Modular Redundant (TMR)

Three PT2060/10 PROX proximity modules and one PT2060/43 R-RELAY Redundant-Relay module constitute a TMR (Triple Modular Redundant). The TMR system's main function is that the PT2060/43 R-RELAY module processes alarm signals from the three PT2060/10 PROX modules and outputs synthetic alarm according to an assigned logic. Each module in the TMR system works independently and functions the same as in non-redundant system. This system can provide alarm message to field operators and the host computer.

A standard 19″ PT2060 rack can contain maximum three sub-systems. Each system has to be on slot 1-4, slot 5-8 and slot 9-12. PT2060/43 R-RELAY module can be mounted in slot 4, 8 and 12 only. Three PT2060/10 PROX modules must be assembled in three adjacent slots, slot 1-3 for example, together with a PT2060/43 R-RELAY module assembled in slot 4 to constitute a TMR system. A 12″ PT2060 rack has one TMR system only. It can be mounted slot 1-4. For more information, please refer to *PT2060/43 R-RELAY Redundant-Relay Module User Manual*.

Figure 2

Other Information

PT2060/10 PROX proximity module has four channels on it. Channel 1 and 2 must have the same channel type. Channel 3 and 4 must have the same channel type too. The channel types of channel 1, 2 and channel 3, 4 may be different. For example, channel 1, 2 can be set to shaft vibration; channel 3, 4 can be set to rotational speed.

PT2060/10 PROX proximity module also supports alarm multiply (only for shaft vibration and low frequency vibration) and alarm bypass functions. Alarm multiply will increase the alarm setup to a factor of two or three depend on configuration setting. Alarm bypass will prohibit the module's alarm engagement.

Any proximity probe system can be interfaced with our PT2060/10 PROX proximity module. Most commonly used proximity probe systems include 5mm, 8mm, 11mm, 25mm and 50mm probes. Such as TM0105 series 5mm probes, TM0180 series 8mm probes, TM0110 series 11mm probes, and TM0120 series 25mm probes. PT2060/10 PROX proximity module can also interface with other manufacture's proximity probe systems, such as 3300XL series 5mm, 8mm and 11mm probe. 7200 series 5mm, 8mm and 11mm probe. 3300 and 7200 series of 25mm, 50mm probes.

When PT2060/10 RPOX module is used to measure speed, it can connect to magnetic pickups.

The major task for PT2060/10 PROX proximity module is to process the input signal, compare the overall with the alarm set-point and output the appropriate status information. It can also output much more information to the field operator and upper-level control system, such as GAP, module

status, alarm status, alarm event and system event.

Module Description

Hardware

One PT2060/10-Front and one PT2060/10-Back constitute a PT2060/10 PROX proximity module. The module has on board status indication. There are three LEDs on PT2060/10-Front panel that display different status of the monitoring channels. There are four buffered output BNCs that corresponding to its four channels. There are four 4-20mA current output terminals on PT2060/10-Back panel.

LED

PT2060/10 PROX proximity module has on-board status indication. There are three LED that displays different status of the monitoring channels.

- ✓ OK / IO
  A steady OK / IO LED indicates that the hardware module, the proximity probe system in the field are working ok.
  Disabled channels will be logically configured as channel OK status.
  If the OK / IO LED flashing with about one second frequency, it indicates
    A. Channel is ok.
    B. The digital communication between the module and the system are working properly.
- ✓ Alarms
  If the Alarm LED is on, it indicates that some channels on the module are in Alert status and/or some channels on the module are in danger status.
- ✓ Bypass
  The Bypass LED will be on if Bypass terminal is plugged in. With the Bypass on, all channels of the module will not output any alarm.

BUF

Four BNC connectors are corresponding to the four channels respectively. The BNCs provide original un-filtered signals for other data acquisition systems.

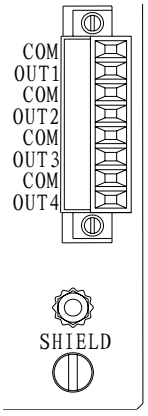


Figure 3

4-20mA output

ProvibTech supply 4-20mA output on each channel as a default setting for our customer. Each PT2060/10 PROX proximity module has up to four channels of 4-20mA output. Figure 3 shows PT2060/10-Back panel. COM/OUT1, COM/OUT2, COM/OUT3 and COM/OUT4 are the 4-20mA current output terminals of the four channels.

Software

PT2060 has powerful configuration software. Via the *PT2060 System Configuration* software, user can perform configurations of PT2060/10 PROX modules. PT2060/10 can be configured to different mode. Full scales, alarms set points, alarm delay etc. can also be field configured. In addition, 4-20mA output can be calibrated. Real-time signal acquired and processed by the PT2060/10 PROX module can be displayed in the software.

Connection: Install the configuration software into a computer, and connect to PT2060 with a standard communication cable.

From *Real-time Value and Status* window of the software the following messages are displayed.

Rack, Slot, Channel

PT2060 rack number, PT2060/10 PROX proximity module slot number and channel number.

Real-time Value

The present value of that channel corresponding to its full scale.

GAP Value

For proximity probes, this stands for the distance between the top of the probes and the measured surface.

Alert, Danger

Is the result of comparing the real-time value with assigned alarm set-point. When the real-time value is higher than or equal to the high limit or is lower than or equal to the low limit, it alarms. True means alarm status and False means no alarm status.

GAP not OK

It indicates GAP alarm status. When GAP value exceeds assigned range, GAP alarms. True means alarm status and False means no alarm status.

Additional Information

PT2060/10 PROX modules are able to provide some additional information, alarm events and system events, for example. The information is collected by PT2060/10 and displayed by *PT2060 System Configuration* software.

Specification

Electrical

Power supply:

- Internally converted by the rack power supply module
- 8.0W total typical for this module

Signal Input:

- Proximity probes
  - Start at 1 RPM (0.0167Hz) for proximity probes
- Magnetic pickup
  - Start at 200 RPM (3.3Hz) for magnetic pickup

Input impedance:

> 20KΩ

Sensitivity:

8mm and 5mm probes: 8.0 mV/μm (200mV/mil)

11mm probe: 4.0 mV/μm (100mV/mil)

25mm probe: 0.8 mV/μm (20mV/mil)

Or any other Sensitivity according to probes choose by customer

Radial Vibration Signal Conditioning:

Frequency Response:

240 to 240,000 RPM (4 to 4.0 kHz), -3dB

Accuracy:

< ±1% FS @25℃

Thrust Position Signal Conditioning:

Accuracy:

< ±0.5% FS @25℃

Eccentricity Signal Conditioning:

Frequency Response:

1 to 600RPM (0.0167 to 10.0Hz), -3dB

Accuracy:

< ±1% FS @25℃

Differential Expansion Signal Conditioning:

Accuracy:

< ±0.5% FS @25℃

Speed / Zero speed Signal Conditioning:

Frequency Response:

The PT2060/10 module will support 1 - 255 events per revolution with a maximum full scale range of 60000 RPM, and a maximum input frequency of 10 kHz. Minimum input frequency for proximity transducers is 0.0167 Hz (1 RPM for 1 event/revolution) and for magnetic pickups (Speed signal conditioning only) is 3.3 Hz.

Accuracy:

The greater of ±0.01% FS or +/- 2 RPM @25℃

Low Frequency Oscillation Signal Conditioning:

Frequency Response:

30 to 6,000RPM (0.5 to 100Hz), -3dB

Accuracy:

< ±1% FS @25℃

Reverse rotational speed Signal Conditioning:

Frequency Response:

The PT2060/10 module will support 1 - 255 events per revolution with a maximum full scale range of 60000 rpm and a maximum input frequency of 10 kHz. Minimum input frequency for proximity transducers is 0.0167 Hz (1 RPM for 1 event/revolution).

Accuracy:

+/-0.1RPM (< 100RPM)

+/-1.0RPM (> 100 and < 10,000RPM)

0.01% (> 10,000 and < 60,000RPM)

Static and Status Values:

Each of the options for this monitor module has been defined with static values. Those values can be accessed via the 4-20mA output or from the digital communication protocols.

Radial Vibration:

Direct (peak to peak), GAP, OK, Alert, Danger, Bypass, Trip-multiply

Thrust Position:

Direct (average), GAP, OK, Alert, Danger, Bypass

Differential Expansion:

Direct (average), GAP, OK, Alert, Danger, Bypass

Eccentricity:

Direct, GAP, OK, Alert, Danger, Bypass

Speed/Zero speed/ Reverse rotational speed:

Direct, Peak Value, GAP, OK, Alert, Danger, Bypass

Low Frequency Oscillation:

Direct (peak to peak), GAP, OK, Alert, Danger, Bypass, Trip-multiply

Overall in 4-20mA output:

Maximum distance:

300m (1000ft)

Proportional to monitor's full-scale. Each channel has its own overall vibration output. The short of the 4-20mA will not affect system performance.

Maximum load:

300Ω

Resolution:

Less than 0.33% FS

Buffered Output:

On PT2060/10-Front panel, each channel has one BNC connector. The output is the unfiltered raw signal.

Output impedance:

550Ω

Maximum distance:

300m (1000ft)

Transducer Power:

-24VDC, current limited. Less than 50mA each channel.

Alarm:

Alarm set-point:

Each channel has two alarm set-points which can be field adjusted from 0 to 100% FS.

Set-point accuracy:

Better than 0.5% FS

Set-point repeatability:

Within 0.5% FS

Alarms:

Normally latching or normally non-latching

Alarm delay:

Alert delay can be set from 1 to 60 seconds with time interval of 1 second

Danger delay can be set from 1 to 60 seconds with time interval of 1 second.

Danger delay also includes a 0.1 second option.

LED Indicators:

OK / IO: green. On, off, flash

Alarms: red

Bypass: red

Approvals:

CE;

CSA:

Non-incendive, class I, div.2, Grps.ABCD, T4@Ta= -40℃ to +75℃

Certificate Number: 2011996

Environmental

Temperature:

Operation: -20℃ ~ +65℃.

Storage: -40℃ ~ +85℃.

Humidity:

95% non-condensing

Physical

Each module comes with two components, the PT2060/10-Front assembly and the PT2060/10-Back assembly.

Dimension:

241mm (9.5in)×24.5mm(0.96in)

For 19″ rack, they can be mounted in any slot from 1 to 12.

For 12″ rack, they can be mounted in any slot from 1 to 6.

Weight:

1.0kg (2.0 lbs)

Module Configuration and Channel Set-up

PT2060/10 PROX proximity module is capable of processing most signals coming from proximity probes, such as shaft vibration, shaft displacement, eccentricity, differential expansion, low frequency vibration, rotational speed, zero speed and reverse rotation. When PT2060/10 RPOX module is used to measure speed, it can connect to magnetic pickups too. To fulfill these functions, PT2060/10 PROX modules and *PT2060 System Configuration* software are needed to work together. In this chapter, the description of the configuration setting is based on PT2060 System Configuration.

Hardware Configuration

Each PT2060/10 PROX proximity module occupies one slot in the rack. A standard 19″ rack can contain up-to twelve PT2060/10 PROX modules. PT2060/10 PROX modules can be mounted in any slot from 1 through 12. A 12″ rack can contain up-to 6 PT2060/10 PROX modules. PT2060/10 PROX modules can be mounted in any slot from 1 through 6. If customers want to realize redundant, the modules should be installed in certin adjacent slot groups according to the redundant requirement.

To configure PT2060/10, communication between *PT2060 System Configuration* software and PT2060/10 module has to be established. This communication is normally setup via. PT2060/91, the system interface module. As Figure 4 shows, Computer will connects PT2060/91, the System Interface Module via the RS232 on the front panel or RS485 or RS232 on the back panel. Please consult *PT2060/91 SIM user manual* for more details.

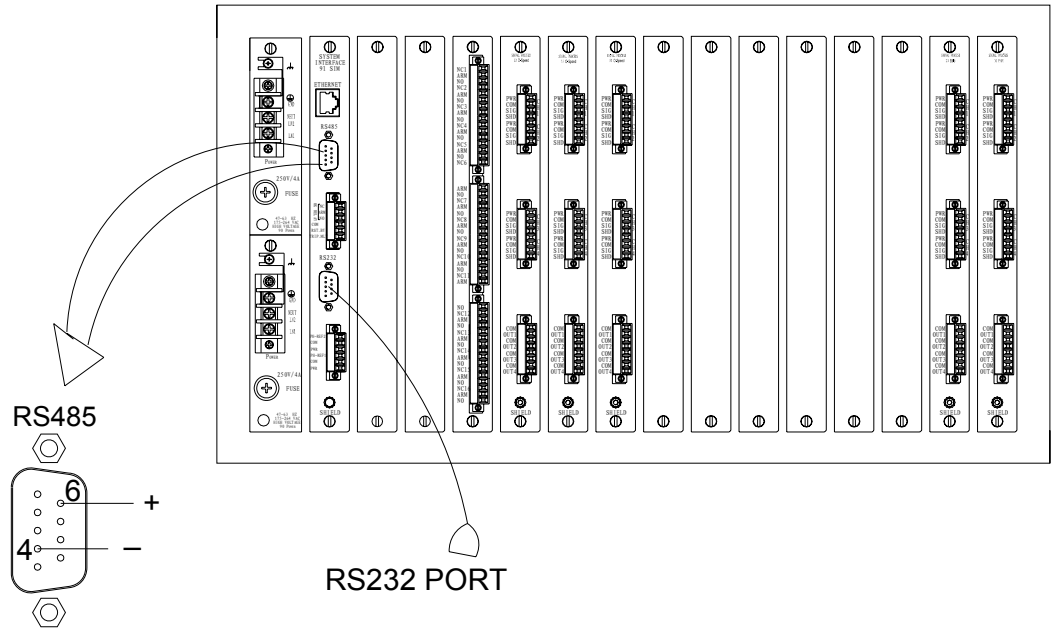


Figure 4

Module Type and Channel Configuration Setting

Configuration Software General Operation

PT2060 System Configure software is an important part of test and maintenance of PT2060. Via the software, PT2060 parameters are configured and the running status is displayed. For more detailed information, please refer to *PT2060 System Configure* software user manual.

The figure below is the main rack window of the software. There are seven main items in the window.

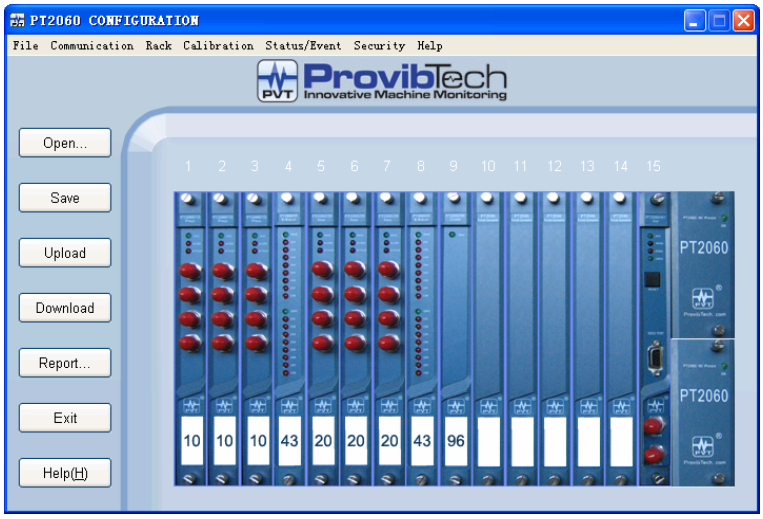


Figure 5

Menu item *File* relates to file operations such as open, save and save as of a configuration file. Also, the item *System Setup* in it is used to alternate the system measurement unit. See the figure below.

Figure 6

Menu item *Communication->Upload* is used to upload all configuration parameters from the PT2060 rack currently connected to the computer and *Communication->Download* is used to download all configuration parameters to the currently connected PT2060 rack.

From *Communication Setup*, connection with PT2060 monitor can be established. Setup communication parameters and click button *Download* to re-set the parameters for the PT2060 rack.

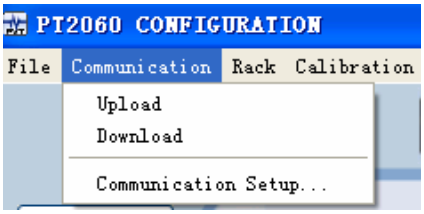


Figure 7

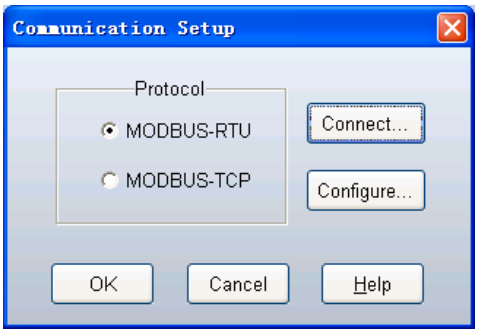


Figure 8

Menu item *Rack* relates to rack operations. Its sub items are listed below.

✓ Rack Clock Setup

Configure system clock of the PT2060 rack.

✓ Rack Reset Setup

Reset all alarms of the PT2060 rack.

✓ Factory Information

Operations related to factory information.

✓ Customized Modbus Registers

Operations related to Modbus Registers of the rack.

✓ Signal Module Control

Operations related to alarm bypass and multiply alarms.

✓ Self-Test

Let the rack go into self-test mode. This is useful for troubleshooting.

Figure 9

Menu item *Calibration* contains two subs, *User Calibration* and *Factory Calibration*. Users could perform User Calibration only.

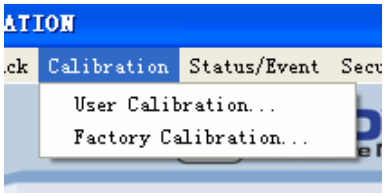


Figure 10

Menu item *Status/Event* contains operations related to current status and alarm events (recent 500 records), such as reading or deleting. Its sub item *Real-time Value and Status* is used to display the messages of all channels. Sub item *Modbus Range Setup* is used to set a coefficient to PT2060 in order to make it compatible with other devices based on the standard Modbus.

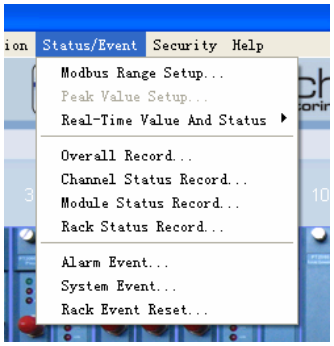


Figure 11

Item *Security* is used for security consideration. Here you can enter different passwords for different permissions. The Factory Password allows factory permission and is for the factory staff only. You can modify the passwords here and set effective time for them. If the period is expired, password has to be reentered to continue your working.

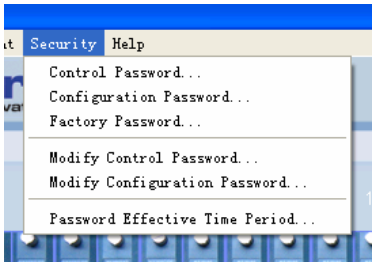


Figure 12

The item *Help* introduces detailed operation steps to the user. It is a quick way to become acquainted with the software.

Figure 13

Module Function Description

Alarm Type

PT2060/10 PROX proximity module has two alarm status, alert and danger.

Alert can be configured to one of the two alarm types, Alert and Gap, if the chosen type is Alert, in *Real-time value and Status* window of *PT2060 System Configuration* software, the column Alert indicates whether it is in alert status, and the column Danger indicates whether it is in danger status. If the chosen type is GAP, in the software window, the column Alert indicates whether the GAP voltage exceeds the assigned value and the column Danger indicates whether it is in danger status.

GAP not OK

When a certain channel of PT2060/10 PROX proximity module has GAP voltage exceeding the setting range, it will turn to GAP not OK status, and the OK / IO LED will be off.

If the current channel's alarm type is Alert, When GAP is not OK, it can be seen from *Real-time Value and Status* interface of *PT2060 System Configuration*, that:

- ✓ Real time value equals to fill scale low limit
- ✓ GAP value is normally displayed, is the current GAP voltage
- ✓ Alert is False, Danger is False (alarm latching has higher privilege than GAP not OK. If before turning to GAP not OK, alarm latched already, Alert and Danger will not change).

Besides, the channels' output current ought to be set to 3.0±0.16mA.

If the current channels' alarm type is GAP, when GAP is not OK, it can be seen from *Real-time Value and Status* interface of *PT2060 System Configuration*, that:

- ✓ Real time value equals to fill scale low limit
- ✓ GAP value is normally displayed, is the current GAP voltage
- ✓ Alert is True, indicating that it is in GAP not OK status
- ✓ Danger is False (alarm latching has higher privilege than GAP not OK. If before turning to GAP not OK, it has Danger latched already, Danger will not change)

Besides, the channels' output current ought to be set to 3.0±0.16mA.

Bypass

There are two types of bypass, hardware bypass and software bypass. When hardware bypass is activated, the Bypass LED on (When software bypass is activated, the LED does not come on). Both types of bypass do not affect monitor performance except the alarms. Bypass will inhibit Danger alarm, Alert alarm. The default status is inactive. Bypass has a higher privilege than alarm latch does.

A channel bypass status may result from the following conditions:

- ✓ PT2060/10 PROX proximity module has never been configured
- ✓ PT2060/10 PROX proximity module is in configure mode

- ✓ Channel of PT2060/10 PROX proximity module has an invalid configuration
- ✓ PT2060/10 PROX proximity module is in power up self-test
- ✓ Fatal error found during self-test
- ✓ Alarming is bypassed via *PT2060 System Configuration*
- ✓ Channel of PT2060/10 PROX proximity module is disable

Alarm Trip-Multiply

PT2060/10 module also supports alarms trip-multiple (applying with shaft vibration and low frequency vibration only).

Trip-multiply will temporarily increase the alarm (Alert and Danger) set-points. Trip-multiply is normally applied by manual (operator) action during startup to allow a machine to pass through high vibration ranges without trigger monitor alarms. Such high vibration ranges may include system resonances and other abnormal transient.

The function of trip-multiply is fulfilled through software under the hardware control i.e. the software multiply function takes effect only after a multiply terminal has been plugged in the socket on the PT2060/91 SIM System Interface module. When alert alarm type is Alert, this function is valid for both alarm levels alert and danger. When alert alarm type is GAP voltage, this function is valid for danger. When double multiply is set, alarm occurs after real-time value reaches two times higher than or equal to alarm set-point value; When triple multiply is set, alarm occurs after real-time value reaches three times higher than or equal to alarm set-point value. The default status is inactive.

Channel Disable

When Channel is un-used, it should be disabled. In this case, from the window *Real-Time Value and Status* it can be seen that GAP not OK, Alert and Danger turn false and GAP value becomes 10.0V. Real time value is full scale low. Or zero for position and temperature channels.

Redundant

A redundant system consists of three PT2060/10 PROX modules and a PT2060/43 R-RELAY module. Any PT2060/10 PROX module in this system works in the same manner as it does in independent mode. Please refer to *PT2060/43 R-RELAY Redundant-Relay Module User Manual* for more details.

Parameter Configuration

After the host computer and the PT2060 are connected, the *PT2060 System Configuration* software can be started. Click the button *Upload* and the messages of PT2060 will be uploaded to the software.

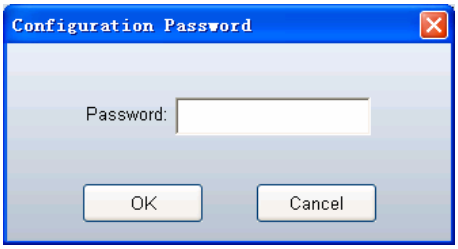


Figure 14

Click the picture of the module you want to configure to open a configuration window for that module, where all parameters can be edited. Download or upload the configuration information according to the need. It needs configuration password when first download or upload. The default configuration password is 1234.

⚠ Warning
PT2060 is unable to alarm and protect in configuration status!!!

Application Advisory
ProvibTech **recommends strongly** that the original configuration setting must be uploaded and saved before performing any modifications to PT2060 parameters.

Vibration Module Type Setting and Parameter Configuration

PT2060/10 PROX proximity module supports proximity probe input, shaft vibration output. The proximity probe is mounted along the radial direction, i.e. the probe is perpendicular to the shaft. A PT2060/10 PROX proximity module can support 4 shaft vibration measuring channels. Typical full scale can be 100, 125, 200, 250, 500, 1000μm or 5, 10, 20, 40mil for 8mm probe.

The following parameters are required:

Channel Type

Proximity probe input, shaft vibration output

Transducer Type

PT2060/10 PROX proximity module can interface with many models of transducers such as,

TM0180/5m
TM0180/9m
TM0105/5m
TM0105/9m
TM0110/5m
TM0110/9m
3300/8mm/5m, 5mm/5m
3300/8mm/9m, 5mm/9m
7200/8mm/5m, 5mm/5m
7200/8mm /9m, 5mm/9m
3300/11mm/5m
3300/11mm/9m
7200/11mm/5m
7200/11mm/9m
Other 8mm Proximity probe transducer
Other 5mm Proximity probe transducer
Other 11mm Proximity probe transducer

Users could choose a proper one according to their application. TM0180/5m is the default transducer.

Transducer Sensitivity

This is the most important parameter that is corresponding to the transducer type and is given by the system. User can also modify it manually. This value is typically expressed as millivolt per measure unit (for example mV/mil for displacement).When the transducer type is TM0180/5m, the default value is 8mv/μm.

Alert Time Delay, Danger Time Delay

It means how long the module will delay before changing into alarm status after having detected that real-time value exceeds or equals to the alarm set-point. The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. User can modify them from 1s to 60s as need.

Full Scale High, Full Scale Low

The high limit and low limit of the full scale. For shaft vibration, Full scale low is 0 by default. Full Scale high is determined according to the application. After these are set, the various alarm hysteresis values are determined. The default value is 1/64 of Full scale high.

Measurement Type

User can make his choice from the drop list. The default one is PK-PK.

Measurement Unit

PT2060/10 PROX proximity module can work with different measurement unit, metric or imperial. From menu item *File->System Setup*, open a new window as the figure below. The measurement unit is μm for metric or mil for imperial.

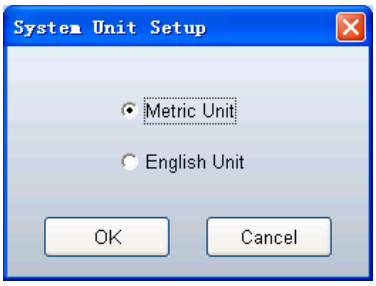


Figure 15

Alert Type

PT2060/10 PROX proximity module vibration monitoring mode supports two types of alarm, Alert and Gap. Alert type means that the module outputs alarm when the real-time value exceeds or equals to alert set-point set by the *PT2060 System Configuration* software. Gap type means that the module outputs alarm when the gap voltage is above or equal to the Upper OK limit and below or equal to the Lower OK limit. Every channel of the module is capable of producing Alarm indication. These indications can be used in relay alarm drive logic which is configured in the Relay module. The default alert type is Alert.

Primary PR

A transducer that produces a voltage pulse for each turn of the shaft, called Phase signal. This signal is used primarily to measure shaft rotational speed and serves as a reference for measuring vibration phase lag angle. It is an essential element in measuring rotor slow roll bow or run out information. User will determine whether to correlate the real-time value with the phase reference and with which one, phase reference 1 or 2. The default setting is NA. Primary PR is prior to Backup PR when redundant phase reference has been used.

Backup PR

The spare phase signal. The item can be set to NA or with Phase Reference 1 or 2. Primary PR and Backup PR can constitute redundant phase reference in which Primary PR is used as the main phase reference signal and is firstly considered by PT2060/10, while Backup PR is used as the secondary phase signal to replace the Primary PR when it is not OK or lost. For example, when user selects *with Phase Reference 1* for Primary PR, *with Phase Reference 2* for Backup PR, phase reference 1 is used as the phase signal firstly and is checked by PT2060. When PT2060/10 examines that Phase Reference 1 is lost or not OK, Phase Reference 2 will be chosen to be the phase signal.

Channel Enabled

Channel Enabled lets you control whether or not the monitor channel is to use. (If the box is checked (√), the channel is in use). All of PT2060/10 PROX proximity module channels are checked by default. User could modify it if necessary.

Alarm Latching

Causes the PT2060/10 PROX proximity module to retain an Alarm status after the Alarm condition has gone away. The latching mode allows you to know if an alarm set-point has been exceeded since the last rack reset. Press the reset button on the rack SIM module will reset all latched alarms in the PT2060 rack if the current proportional value is less than the set-point value. You can also reset the rack by using the software

PT2060 System Configuration. The Event list for the monitor will provide information about faulted transducers even if non-latching is selected. The default status is latched and user can modify it.

Set Point

Shaft vibration alarm threshold is set here. There are two levels of alarm for shaft vibration mode. The value can be set to some certain percentage of FS. Default factory setting of Danger high is 75%, Alert high 50%. Gap alarm has two levels too. Default factory setting of GAP high is -19V, GAP low -1V. When the alarm condition is satisfied, PT2060 goes in alarm status.

The figure below is an example of PT2060/10 PROX proximity module shaft vibration configuration setting.

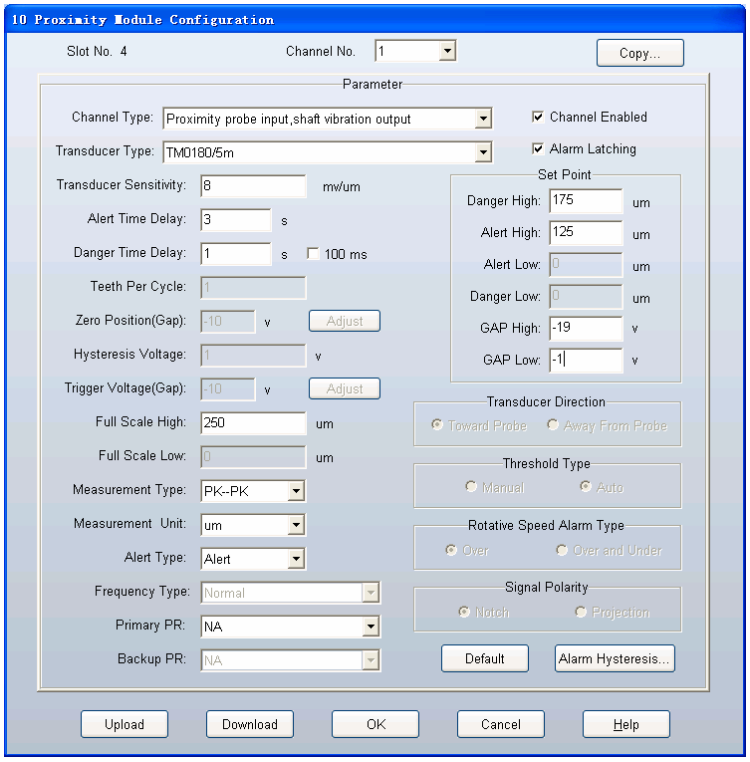


Figure 16

Shaft Position Mode Type Setting and Parameter Configuration

PT2060/10 PROX proximity module supports proximity probe input, shaft position output mode. The proximity probe should be installed perpendicular to the monitored surface. A PT2060/10 PROX proximity module can support up to four shaft position channels. Typical full scale can be set to 2mm, 4mm,or 80mil, 160mil.

The following parameters setting are required.

Channel Type

Proximity probe input, shaft position output

Transducer Type

There are many models of transducers can be connected such as:

TM0180/5m

TM0180/9m
TM0105/5m
TM0105/9m
TM0110/5m
TM0110/9m
3300/8mm/5m, 5mm/5m
3300/8mm/9m, 5mm/9m
7200/8mm/5m, 5mm/5m
7200/8mm /9m, 5mm/9m
3300/11mm/5m
3300/11mm/9m
7200/11mm/5m
7200/11mm/9m
Other 8mm Proximity probe transducer
Other 5mm Proximity probe transducer
Other 11mm Proximity probe transducer

Users could choose different probes according to their concrete applications. TM0180/5m is the default transducer.

Transducer Sensitivity

When transducer type is TM0180/5m, the default value is 8.0mv/μm. User could set this parameter according to its actual situation.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. User can modify them from 1s to 60s as need.

Zero Position

The transducer voltage corresponds to the nominal DC shaft position. The voltage specified will correspond to the zero point for the direct proportional value on the user display. The factory default value is -10V. User could modify it manually or by clicking the button *Adjust* to let the system get it automatically.

Full Scale High, Full Scale Low

Full scale low is set to -1000μm and Full scale high is set to 1000μm by default. User could set this parameter according to its actual situation. After these items have been set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high.

Measurement Type

The default measuring type is always AVERAGE.

Measurement Unit

It could alternate between metric μm, mm and imperial mil, inch.

Alert Type

The default alarm type is Alert.

Channel Enabled, Alarm Latching

The default status is enabled and latched. User can modify it.

Set Point

Default factory setting of Danger high is 700μm, of Alert high is 500μm, of Danger low is -700μm, of Alert low is -500μm. Gap alarm has two levels. Default factory setting of GAP high is -19V, GAP low -1V.

Transducer Direction

Define the normal direction as movement "toward" the transducer or "away" from the transducer. If the normal movement of the machine rotor is toward the transducer then "toward" should be selected. Otherwise, select "away". The default direction is “Toward Probe” for shaft position measuring mode. User could modify it if necessary.

The figure below is an example of PT2060/10 PROX proximity module shaft position configuration setting.

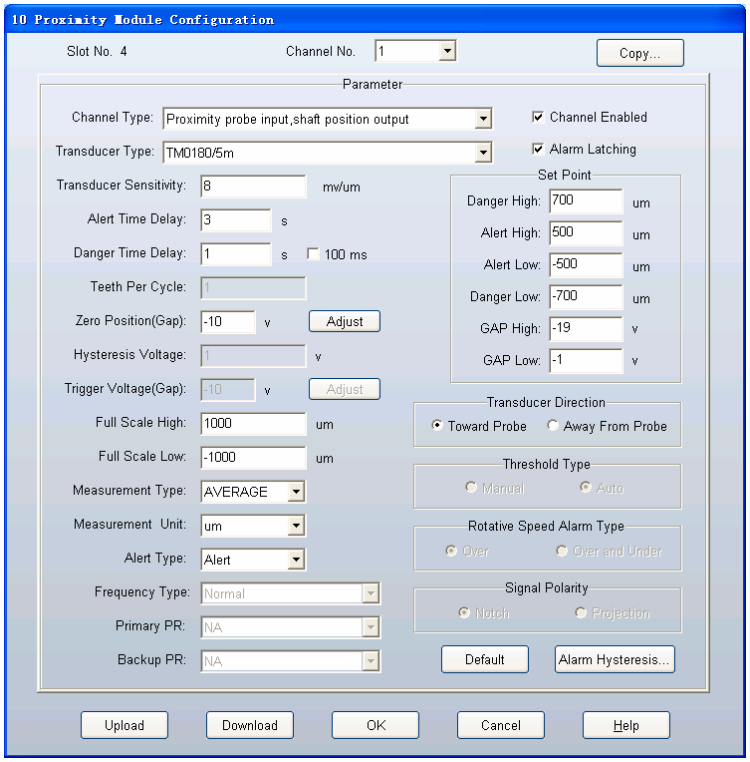


Figure 17

Differential Expansion Mode Type and Parameter Configuration

PT2060/10 PROX modules support proximity probe input, differential expansion output mode. The probe should be mounted perpendicular to the monitored surface. A PT2060/10 PROX proximity module supports up to four differential expansion channels. Current monitor module support single probe configuration per channel. Typical full scale can be set to 5mm, 10mm, or 0.2inch, 0.4inch.

The following parameters are required for its operating.

Channel Type

Proximity probe input, differential expansion output

Transducer Type

There are many models of transducers can be connected such as:

TM0120

Other 25mm Proximity probe transducer

Users could choose different probes according to their concrete applications. TM0120 is the default

transducer.

Transducer Sensitivity

When TM0120 is the default transducer, the default value is 0.8mv/um.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. User can modify them from 1s to 60s as need.

Zero Position

Factory default set value is -6V. User could set this parameter according to its actual situation or click the button *Adjust* to let the system get it automatically.

Full Scale High, Full Scale Low

User could set this parameter according to its actual situation. 5mm and -5mm are the default value. After these items have been set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high.

Measurement Type

Default measurement type is AVERAGE.

Measurement Unit

It could alternate between metric μm, mm and imperial mil, inch. It can be changed by users.

Alert Type

The default alarm type is Alert.

Channel Enabled, Alarm Latching

The default status are enabled and latched.

Set Point

There are four levels of differential expansion alarm. GAP alarm has two alarm levels. GAP high limit is set to -12V, GAP low limit is set to -0.5V by default.

Transducer Direction

The default direction is “Toward Probe” for differential expansion measuring mode. User could modify it if necessary.

The figure below is an example of differential expansion configuration.

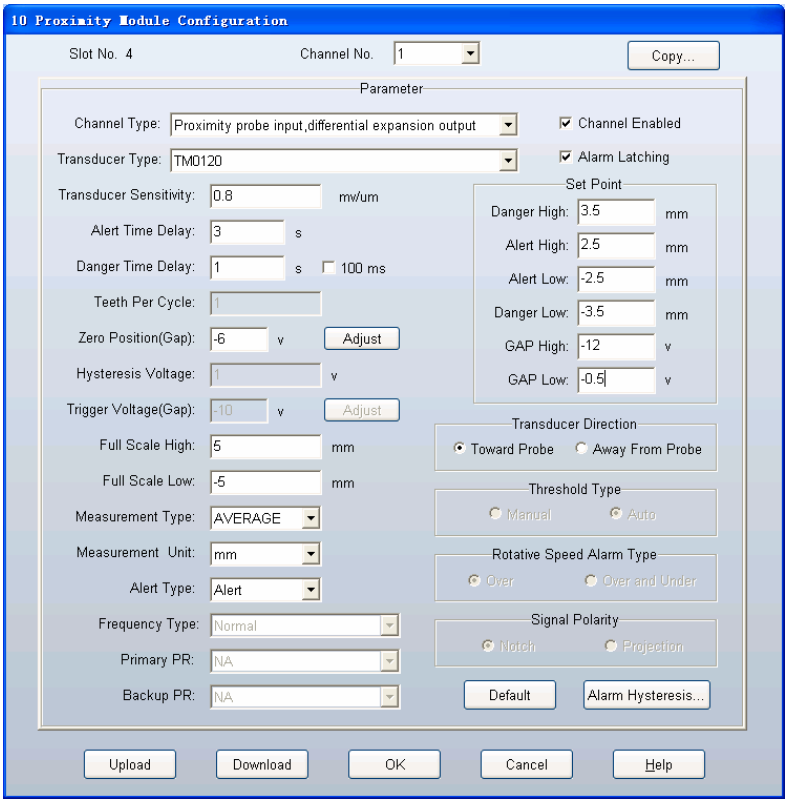


Figure 18

Eccentricity Mode Type and Parameter Configuration

PT2060/10 PROX modules support proximity probe input, eccentricity output mode. To work in this mode, two channels must be grouped. Channel 1, 2 form a group and channel 3, 4 form another. The first channel of the group need connect to transducer. The status of channel enable of the second channel should be compatible with that of the first channel in a group. When the first channel is enabled, the second is enabled too. The configuration for the first channel is similar to shaft vibration and the configuration for the second channel is similar to that for shaft position. Besides, it needs phase reference signal to implement it function.

Assuming that the machine rotation speed is f,

When f ≥ 600RPM, the first channel real-time value is PK-PK without alarm status, and the second is 0;

When 6RPM ≤ f < 600RPM, the first channel real-time value is PK-PK, and the second is the average GAP;

When 1RPM ≤ f < 6RPM, the first channel real-time value is PK-PK, and the second is real-time GAP;

When 0 ≤ f < 1RPM, the first channel real-time value is 0, and the second channel is real-time GAP.

For eccentricity measuring mode, the full scale can be set to 100, 200, 1000μm, or 5, 10, 40mil.

The following parameters are required:

Channel 1:

Channel Type

Proximity probe input, eccentricity output.

Transducer Type

There are many models of transducers can be connected such as:

- TM0180/5m
- TM0180/9m
- TM0105/5m
- TM0105/9m
- TM0110/5m
- TM0110/9m
- 3300/8mm/5m, 5mm/5m
- 3300/8mm/9m, 5mm/9m
- 7200/8mm/5m, 5mm/5m
- 7200/8mm /9m, 5mm/9m
- 3300/11mm/5m
- 3300/11mm/9m
- 7200/11mm/5m
- 7200/11mm/9m
- Other 8mm Proximity probe transducer
- Other 5mm Proximity probe transducer
- Other 11mm Proximity probe transducer

Users could choose different probes according to their applications. TM0180/5m is the default transducer.

Transducer Sensitivity

When transducer type is TM0180/5m, the default value is 8.0mv/μm. User could set this parameter according to its actual situation.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. User can modify them from 1s to 60s as need.

Full Scale High, Full Scale Low

User could set this parameter according to its actual situation. After these items have been set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high. Full scale low is set to 0 by default.

Measurement Type

The first channel of group is set to PK-PK.

Measurement Unit

It could alternate between metric μm and mil. It can be changed by users.

Alert Type

The default alarm type is Alert.

Primary PR

A transducer that produces a voltage pulse for each turn of the shaft, called Phase signal. This signal is used primarily to measure shaft rotational speed and serves as a reference for measuring vibration phase lag angle. It is an essential element in measuring rotor slow roll bow or run out information. User will determine whether to correlate the real-time value with the phase reference and with which one, phase reference 1 or 2. The default setting is NA. Primary PR is prior to Backup PR when redundant phase reference has been used.

Backup PR

The spare phase signal. The item can be set to NA or with Phase Reference 1 or 2. Primary PR and Backup PR can constitute redundant phase reference in which Primary PR is used as the main phase reference signal and is firstly considered by PT2060/10, while Backup PR is used as the secondary phase signal to replace the Primary PR when it is not OK or lost. For example, when user selects *with Phase Reference 1* for Primary PR, *with Phase Reference 2* for Backup PR, phase reference 1 is used as the phase signal firstly and is checked by PT2060. When PT2060/10 examines that Phase Reference 1 is lost or not OK, Phase Reference 2 will be chosen to be the phase signal.

Channel Enabled, Alarm Latching

They are checked by default.

Set Point

There are two levels of Alert and GAP alarm. The default GAP High is set to -19V and GAP Low is set to -1V.

Channel 2:

Channel Type

The same as the first channel.

Transducer Type

The same as the first channel.

Transducer Sensitivity

The same as the first channel.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. User can modify them from 1s to 60s as need.

Zero Position

The default value is -10v. User could set this parameter according to its actual situation or click the button *Adjust* to let the system get it automatically.

Full Scale High, Full Scale Low

User could set this parameter according to its actual situation. When this is set, the hysteresis of various alarms is determined. The default value is 1/64 of Full scale high.

Measurement Type

The second channel of group is set to AVERAGE.

Measurement Unit

It could alternate between metric um and mil. It can be changed by users.

Alert Type

The default alarm type is Alert.

Primary PR/Backup PR

The same setting as what is for channel 1.

Channel Enabled, Alarm Latching

The default status is alarm latched and channel enabled.

Note: That the channel 2 is always compatible with channel 1. When the channel 1 is disabled, the channel 2 is disabled too.

Set Point

There are four levels of alarm status. The Gap alarm point is the same to the first channel.

The figures below are examples of eccentricity measuring configuration setting.

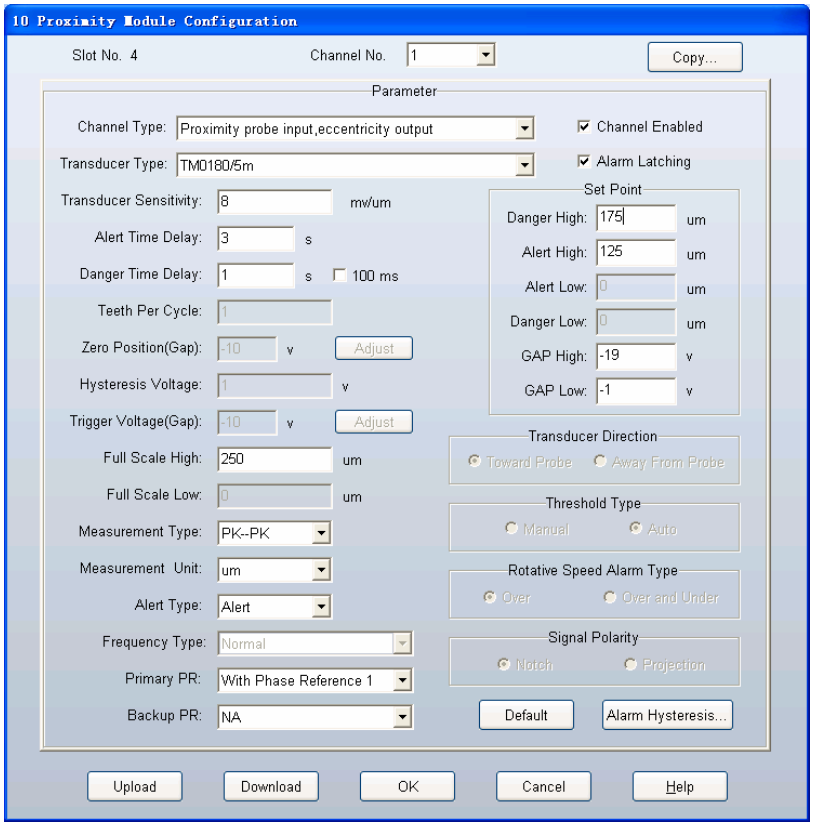


Figure 19

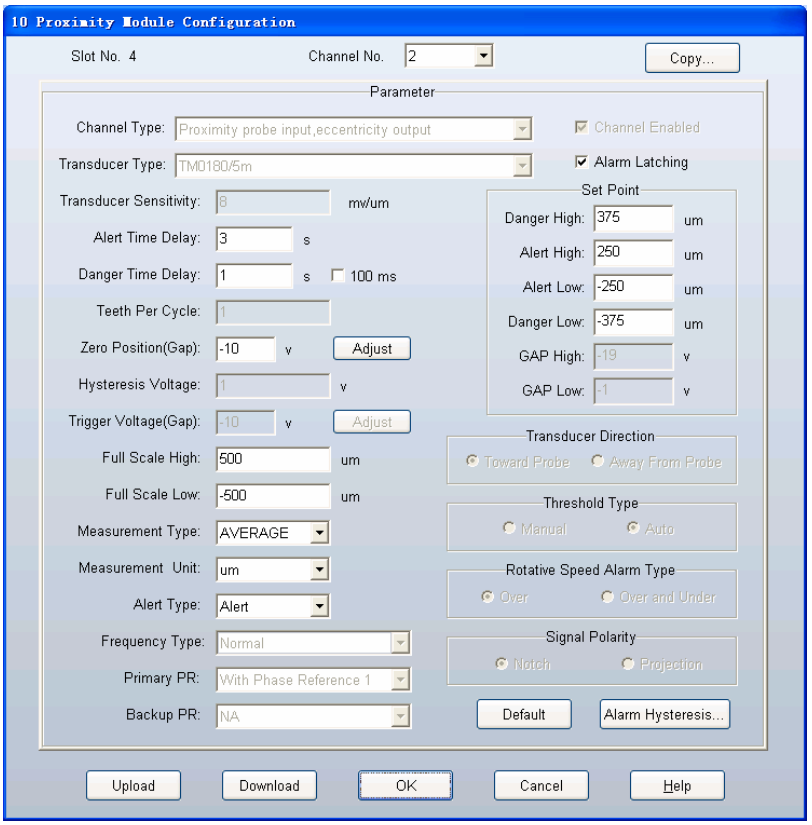


Figure 20

Low Frequency Vibration Mode Type and Parameter Configuration

PT2060/10 PROX modules support proximity probe input, low frequency vibration output mode. It is used to monitor low frequent machines, such as hydraulic turbines. Measuring range is 0.5Hz~100Hz. A PT2060/10 PROX proximity module can support up to four low frequency vibration measuring channels. Typical full scale can be set to 100, 200, 1000 μm, or 5, 10, 40mil.

The following parameters are required:

Channel Type

Proximity probe input, low frequency vibration output

Transducer Type

There are many models of transducers can be connected such as:

- TM0180/5m
- TM0180/9m
- TM0105/5m
- TM0105/9m
- TM0110/5m
- TM0110/9m
- 3300/8mm/5m, 5mm/5m
- 3300/8mm/9m, 5mm/9m
- 7200/8mm/5m, 5mm/5m
- 7200/8mm /9m, 5mm/9m
- 3300/11mm/5m
- 3300/11mm/9m
- 7200/11mm/5m
- 7200/11mm/9m
- Other 8mm Proximity probe transducer
- Other 5mm Proximity probe transducer
- Other 11mm Proximity probe transducer

Users could choose different probes according to their concrete applications. TM0180/5m is the default transducer.

Transducer Sensitivity

When transducer type is TM0180/5m, the default value is 8.0mv/μm. User could set this parameter according to its actual situation.

Alert Time Delay, Danger Time Delay

The default value for Alert Time Delay is 3 seconds, and for Danger Time Delay is 1 second. User can modify them from 1s to 60s as need.

Full Scale High, Full Scale Low

User could set this according to the actual need. After this has been set, the hysteresis of various alarms is determined. They are 1/64 of Full scale high by default

Measurement Type

The default measurement type is PK-PK.

Measurement Unit

It could alternate between metric um and mil. It can be changed by users.

Alert Type

Alert or Gap. Alert is the default alarm type.

Primary PR

Refer to Shaft vibration channel type.

Backup PR

Refer to Shaft position channel type.

Channel Enabled, Alarm Latching

The default status is channel enabled and alarm latched.

Set Point

There are two levels of Alert and GAP alarm. GAP High is set to -19V and GAP Low is set to -1V by default.

The figure below is an example of PT2060/10 PROX proximity module low frequency vibration configuration.

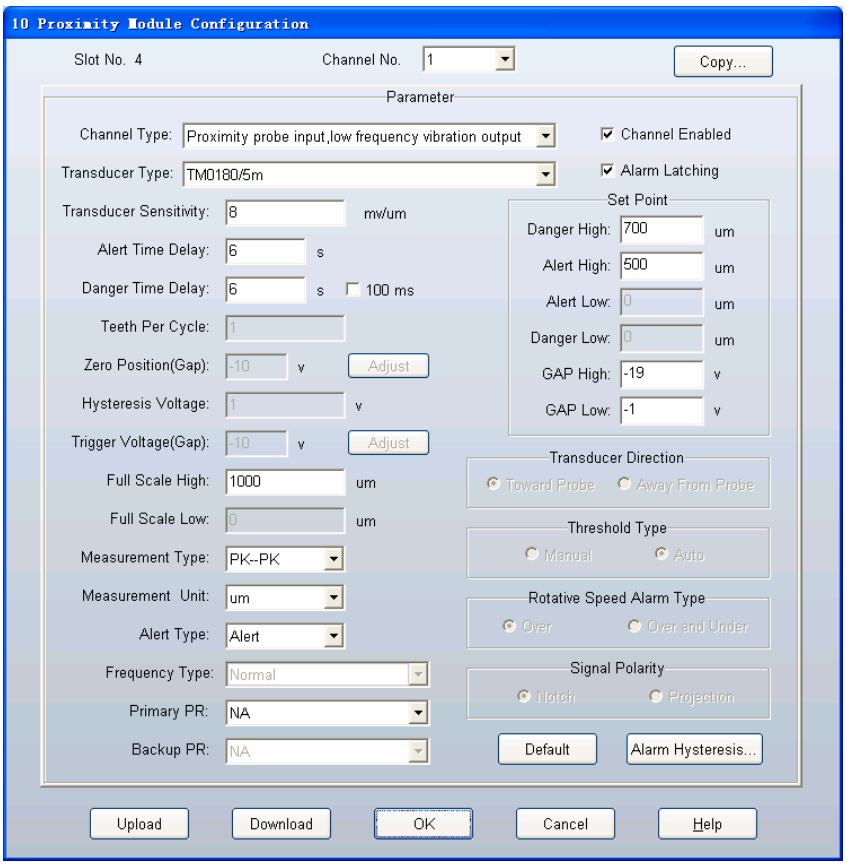


Figure 21

Speed Mode Type and Parameter Configuration

PT2060/10 PROX modules support speed output mode and can be used to monitor shaft rotational speed. Working in this mode, channel 1 and 3 are enabled. This means that only channel 1 and 3 have transducers connected to them. Typical full scale can be set to 100, 1000, 3600, 6000, 10000RPM.

The following parameters are required for its normal operating.

Channel Type

Proximity probe input, Speed output

Transducer Type

PT2060/10 PROX proximity module can adapt it to many transducer models, including:

- TM0180/5m
- TM0180/9m
- TM0105/5m
- TM0105/9m
- TM0110/5m
- TM0110/9m
- 3300/8mm/5m, 5mm/5m
- 3300/8mm/9m, 5mm/9m
- 7200/8mm/5m, 5mm/5m
- 7200/8mm /9m, 5mm/9m
- 3300/11mm/5m
- 3300/11mm/9m
- 7200/11mm/5m
- 7200/11mm/9m
- Other 8mm Proximity probe transducer
- Other 5mm Proximity probe transducer
- Other 11mm Proximity probe transducer
- Magnetic pickup

User could choose transducers according to their actual need.

Transducer Sensitivity

The value is related to the transducer type. When the transducer type is anyone of proximity probes, this value is set by the system and also can be modified manually. Default value is 8mv/μm. When the transducer type is magnetic pickup, it invalidates.

Teeth Per Cycle

Teeth number on the gear. The number of input pulses per shaft revolution when observing an integral multi-event signal source, such as a gear. The Events per Revolution may be specified as a number between 1 and 255 with four decimals . Default is 1 . User could set it according to the actual value in the field. For example, if there are 24 teeth on the gear, teeth per cycle can be set to 23.9998 to adjust the rotation speed slightly according to the need in the field.

Hysteresis Voltage

This is the voltage level above and below the threshold value which is required to "trigger" the input signal from the transducer. The larger the hysteresis, the greater the immunity to noise on the input signal. When the input signal passes the threshold voltage plus 1/2 of the Hysteresis voltage, the signal goes high. When the input signal returns to the threshold voltage minus 1/2 of the Hysteresis voltage, the signal goes low. The default value is 1V and user could modify it between 0.5-2.5V.

Trigger Voltage

The Trigger Value is the nominal voltage that the Hysteresis is centered about. The default value is -10V. When the item Threshold Type is set to Manual, user could fill this manually or click the button *Adjust* to let the system get it automatically.

Full Scale High, Full Scale Low

Could be set by user, the hysteresis value is always 10RPM.

Measurement Type

The real-time value stands for the shaft rotational speed, measurement type is NA.

Measurement Unit

It always is RPM.

Alert Type

When the transducer type is magnetic pickup, it does not support GAP alarm. Otherwise, the default value is Alert.

Channel Enabled, Alarm Latching

The default status is channel enabled and alarm latched.

Set Point

This value is set by the system and also can be modified manually. When the transducer type is proximity probes, default factory setting of Danger high or High is 75%, Alert high or Low is 50%. And the default factory setting of GAP high is -24V, GAP low is -1V. When the transducer type is magnetic pickup, the GAP alarm is invalidates.

Threshold Type

The voltage level of the transducer signal where triggering occurs (if the Hysteresis voltage is 0).

Auto

The trigger threshold is automatically set to a value that is midway between the most positive peak and the most negative peak of the input signal. This value tracks any changes in the input signal. Auto threshold requires a minimum signal amplitude of 1 V pp and a minimum frequency of 0.0167 Hz.

Manual

The trigger threshold is set by the user to any value in the range of -8 to -14 volts. Manual threshold requires a minimum signal amplitude of 500 millivolts peak to peak.

Rotative Speed Alarm Type

Two types: Over rotative speed alarm, Over and Under rotative speed alarm.

Over

Two level high alarm: danger high and alert high. If selected, the item *Set Point* is present to be Danger High and Alert High. When the real-time value is higher than or equal to alert high or higher than or equal to danger high, alarms occurs.

Over And Under

One high alarm, one low alarm. If chosen, the item *Set Point* will turn to *High* and *Low*. Alert alarm occurs when real-time value is lower than or equal to the Low set point. Danger alarm occurs when the real-time value is higher than or equal to the High set point, It does not alarm when real-time value is between High and Low set points.

Signal Polarity

Notch

An output pulse, produced for use by the monitors that is triggered by the leading edge of a negative-going pulse in the input signal. If a magnetic pickup is used, set Notch/Projection setting to Notch.

Projection

An output pulse, produced for use by the monitors that is triggered by the leading edge of a positive-going pulse in the input signal.

Peak Value

The maximum speed recorded by the PT2060/10 since the last peak value reset occurred. Click the drop down list *Peak Value Setup* of menu *status/Event* to open *Peak value* window where peak value is present,

see figure 22 and 23.

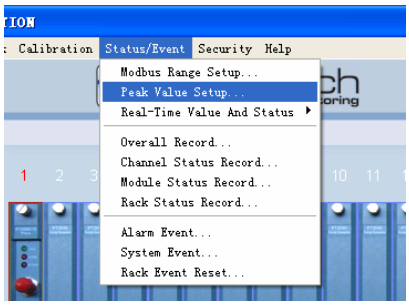


Figure 22

PT2060/10 retains the peak value even after loss of module power. Click the Reset button in configuration software as the figure 23 shows, the Peak value will be reset to the present speed. Clicking the Reset button can reset the peak values of the current corresponding slots and channels, while Reset All can reset the peak values of all the speed type channels.

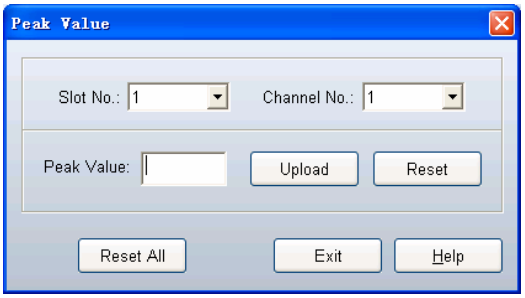


Figure 23

The figure below is an example of PT2060/10 PROX proximity module speed configuration.

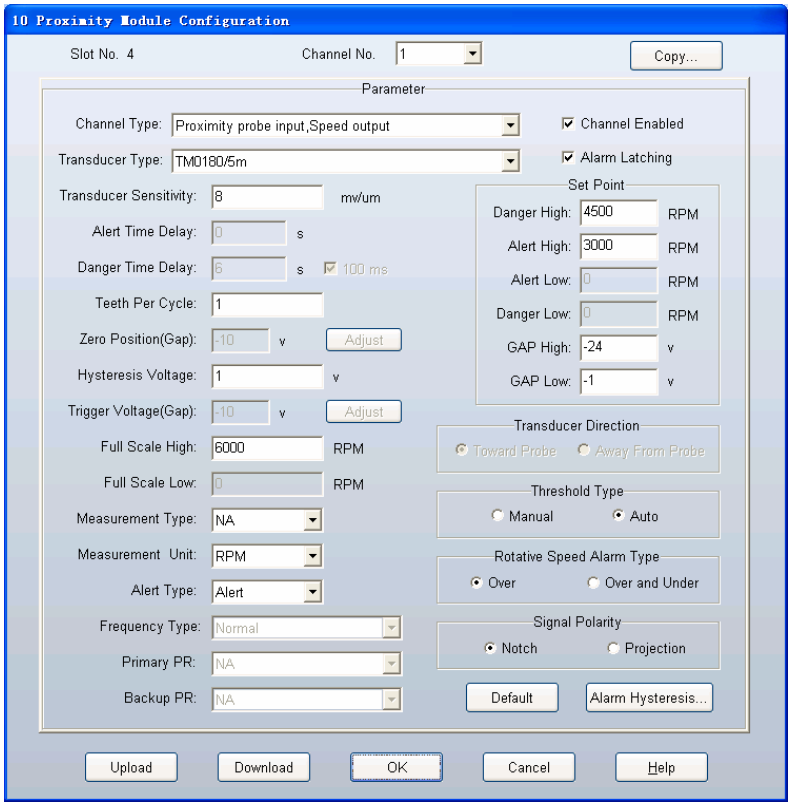


Figure 24

Zero Speed Mode Type and Parameter Configurations

PT2060/10 PROX modules support Zero Speed output mode and can also be used to monitor shaft rotational speed.

Working in this mode, channel 1 and 2 are combined together in a group. And channel 3 and 4 are tied together to form another group. Only channel 1 and 3 have transducers connected to them. When the shaft rotational speed is less than 100RPM, the two-output channels in one group output real-time value. Channel one is for Zero measurement only. Thus, it has higher accuracy, and been used to trigger alarms. When the shaft rotational speed is higher than 100RPM and less than 60000RPM, the first channel constantly outputs 100 RPM and the second channel outputs the real-time value. The status of the item Channel Enabled and GAP not OK are the same for the two channels.

Typical full scale of channel 1 can be set to 100 RPM, and channel 2 can be set to 1000, 3000, 3600, 6000, 10000RPM.
Zero speed mode type can cover speed measurement. But speed measurement can not cover Zero speed.

The configuration for PT2060/10 PROX proximity module zero speed is analogous to the configuration for PT2060/10 Speed. User should pay attention to the followings.

Channel Type
Zero speed output
Transducer Type
PT2060/10 PROX proximity module can adapt it to many transducer models, including:

- TM0180/5m
- TM0180/9m
- TM0105/5m
- TM0105/9m
- TM0110/5m
- TM0110/9m
- 3300/8mm/5m, 5mm/5m
- 3300/8mm/9m, 5mm/9m
- 7200/8mm/5m, 5mm/5m
- 7200/8mm /9m, 5mm/9m
- 3300/11mm/5m
- 3300/11mm/9m
- 7200/11mm/5m
- 7200/11mm/9m
- Other 8mm Proximity probe transducer
- Other 5mm Proximity probe transducer
- Other 11mm Proximity probe transducer
- Magnetic pickup can't be used.

Full Scale High, Full Scale Low
Set by user. The default hysteresis value of first channel is always 2RPM and second channel is 10RPM.

Rotative Speed Alarm Type

Two types: Under rotative speed alarm; Over and Under rotative speed alarm.

Under

For channel 1, alert low and danger low. If selected, the item Set Point is present to be Alert Low and Danger Low. When the real-time value is lower than or equal to Alert Low or lower than or equal to Danger Low, alarms occurs. For channel 2, the same to Rotative Speed Alarm Type.

Over And Under

For channel 1, One high alarm, one low alarm. If chosen, the item Set Point will turn to High and Low. Alert alarm occurs when real-time value is higher than or equal to the High set point. Danger alarm occurs when the real-time value is lower than or equal to the Low set point, It does not alarm when real-time value is between High and Low set points. For channel 2, the same to Rotative Speed Alarm Type.

Set Point

For channel 1, when channel type is Zero speed output, there are only two levels low limits or one high, one low limit in alarm. The value can be set to some certain percentage of FS. Default factory setting of Danger low or Low is 33RPM, Alert low or High is 66RPM, GAP high is -24V, GAP low is -1V.

For channel 2, as the same to speed type, there are only two high limits or one high, one low limit in alarm. Default factory setting of Danger High or High is 4500 RPM, Alert High or Low is 3000PRM. GAP high is -24V, GAP low is -1V. For any other configuration setting, please refer to Speed.

The following figures is an example of PT2060/10 PROX proximity module zero speed configuration setting.

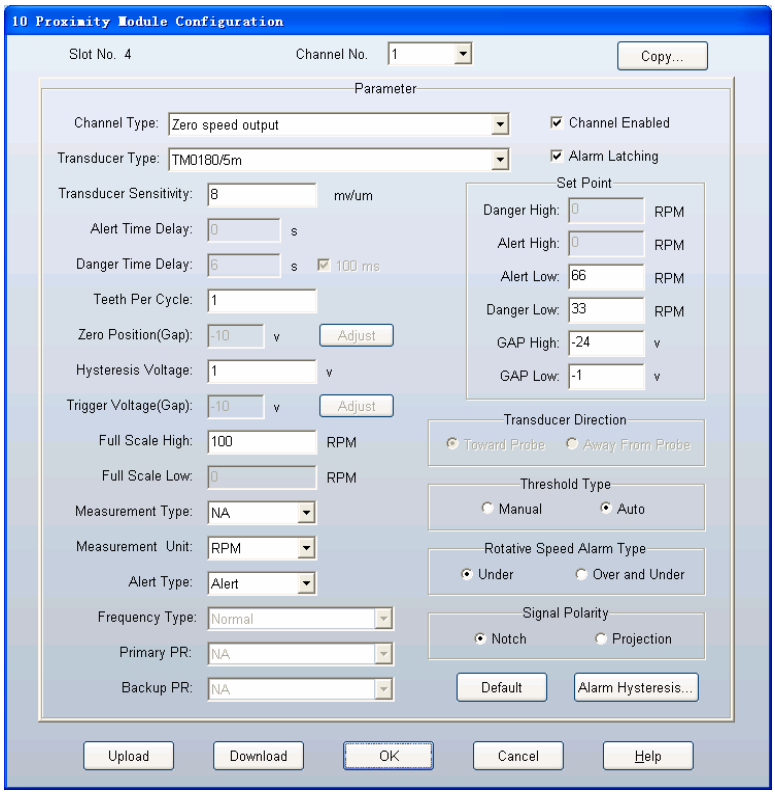


Figure 25

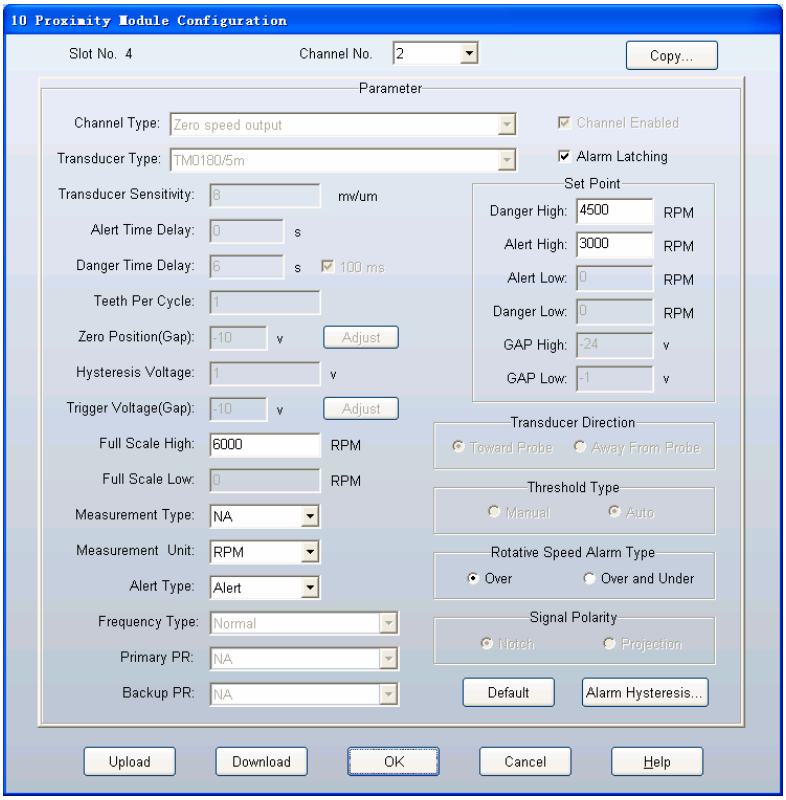


Figure 26

Reverse Rotational Speed Mode Type and Parameter Configuration

PT2060/10 modules support Reverse rotational speed output measuring mode. In this mode, it is divided into two groups. Channel 1, 2 constitute one group and channel 3, 4 constitute another group. Channel 1 and 3 are normal speed channel. Their full-scale range can be set to 100, 1000, 3600, 6000, 10000RPM. When the shaft rotational speed is less than 100RPM (in the periods of starting and stopping), the module output the real-time value according to the direction of rotation. Note, that the reverse rotation is named relatively to forward rotation based on which channel is taken as the criterion. For example, when Leading Transducer is set to channel 1 and the signal of channel 2 lags the signal of channel 1, it is named forward rotation; otherwise, reverse rotation. When Leading Transducer is set to channel 2 and the signal of channel 1 lags the signal of channel 2, it is named forward rotation; otherwise, reverse rotation.

Two proximity probes are required in a group. The module analyses the rotation direction at power on. If it is forward rotation, the first channel outputs the real-time rotational speed and its output current is corresponding to its speed; Channel 2 gives 0 as its real-time value and output 4mA current constantly. Channel 1's alarm status is the same to that of rotational speed. Channel 2 has no alarm. If it is reverse rotation, channel 2 outputs the real-time rotational speed and outputs current corresponding to its speed; Channel 1 gives 0 as its real-time value and outputs 4.0mA current constantly. Alert alarm is setted, danger alarm status is determined by the comparison of real-time value and danger alarm setpoint.

Therefore, when it is forward rotation, the measured message is mainly shown through channel 1; when it is

reverse rotation, the measured message is mainly displayed through channel 2. For forward rotation, there are two kinds of alarm: two level alarms and one high alarm, one low alarm and the alarm runs in the same way as that of speed channel type. Reverse rotation is different from speed channel type, Alert status only indicates reverse rotation direction. The alarm status could be seen from the *Real-time Value and Status* window of the software *PT2060 system configuration* and from the Alarm LED on PT2060/10-Front panel. The reverse alarm means that it outputs alarm when the signal is in reverse rotation state which can be seen form the *Real-time Value and Status* window of the software. The Alert value turns true, that means it is in reverse rotation state. Accordingly, the Alarm LED on PT2060/10-Front panel is on. When the Alert value in the software window turns False, it means that the signals are in forward rotation state.

In a group, the item Channel Enabled of the two channels is configured with the same status. Besides one channel is GAP not OK, so does the other one.

PT2060/10 PROX proximity module reverse rotational speed full scale can be set to 100, 1000, 3600, 6000, 10000RPM.

The following parameters are required.

Channel 1/3

Channel Type

Reverse rotational speed output

Transducer Type

PT2060/10 PROX proximity module can adapt it to many transducer models, including:

- TM0180/5m
- TM0180/9m
- TM0105/5m
- TM0105/9m
- TM0110/5m
- TM0110/9m
- 3300/8mm/5m, 5mm/5m
- 3300/8mm/9m, 5mm/9m
- 7200/8mm/5m, 5mm/5m
- 7200/8mm/9m, 5mm/9m
- 3300/11mm/5m
- 3300/11mm/9m
- 7200/11mm/5m
- 7200/11mm/9m
- Other 8mm Proximity probe transducer
- Other 5mm Proximity probe transducer
- Other 11mm Proximity probe transducer

Users could choose transducers according to the actual application. TM0180/5m is the default transducer.

Transducer Sensitivity

When transducer type is TM0180/5m, the default value is 8.0mv/μm. User could set this parameter according to its actual situation.

Teeth Per Cycle

Teeth number on the gear. The number of input pulses per shaft revolution when observing an integral multi-event signal source, such as a gear. The Events per Revolution may be specified as a number between 1 and 255 with four decimals . Default is 1 . User could set it according to the actual value in the field. For example, if there are 24 teeth on the gear, teeth per cycle can be set to 23.9998 to adjust the rotation speed slightly according to the need in the field.

Hysteresis Voltage

The default value is 1V. User could modify this value according to actual need. The value is limited to 0.5V~2.5V.

Trigger Voltage

The default value is -10V. When the item Threshold Type is set to manual, this value can be modified or click the button *Adjust* to let the system get it automatically.

Full Scale High, Full Scale Low

Could be set by user, the default hysteresis value is always 10RPM.

Measurement Type

Measurement type is NA.

Measurement Unit

It is always RPM.

Alert Type

It is always Alert type.

Channel Enabled, Alarm Latching

The default status is checked.

Set Point

The channel needs two high limits or one high, one low limit to be set. In the default setting, GAP High is set to -24V and GAP Low is set to -1V.

Leading Transducer

Be used to analyze the rotation direction.

Threshold Type

The default value is “Auto”. User could modify it.

Rotative Speed Alarm Type

The same to Speed Mode Type.

Signal Polarity

The same to Speed Mode Type.

For any other configuration setting, please refer to Speed.

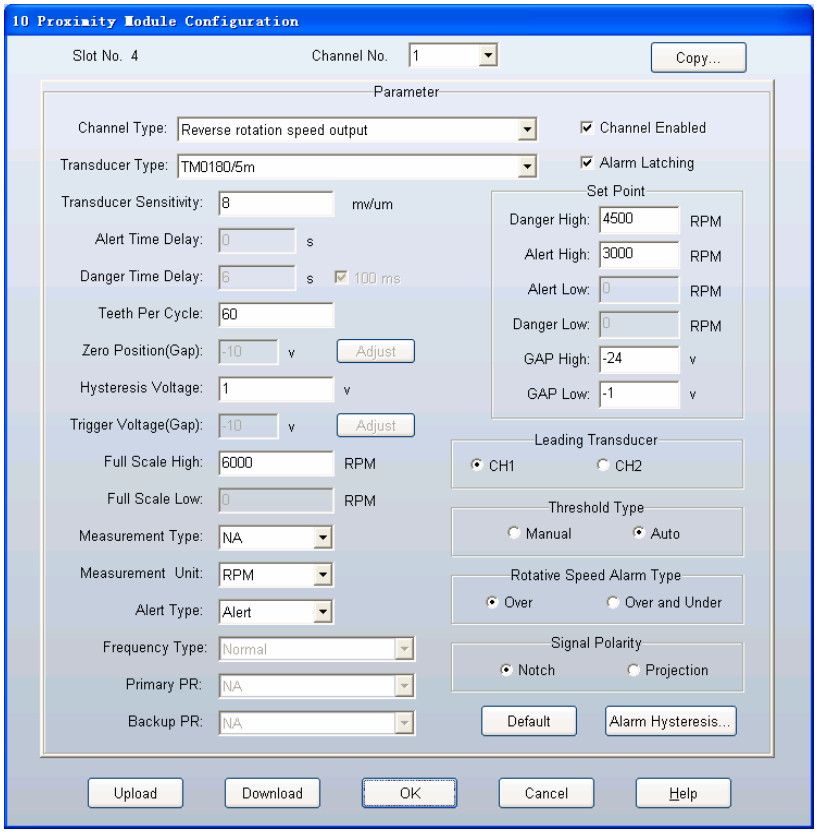


Figure 27

Channel 2/4

Channel Type

Reverse rotational speed output

Transducer Type

Refer to Channel 1/3. User should choose it according to actual need.

Transducer Sensitivity

Refer to Channel 1/3.

Teeth Per Cycle

The same as channel 1/3.

Hysteresis Voltage

Refer to Channel 1/3.

Trigger Voltage

Refer to Channel 1/3. When the item Threshold Type is set to manual, this value can be modified or click the button *Adjust* to let the system get it automatically.

Full Scale High, Full Scale Low

The same as what is for channel 1/3.

Measurement Type

Measurement type is NA.

Measurement Unit

It always is RPM.

Alert Type

It always is Alert type.

Channel Enabled

The same as channel 1/3

Alarm Latching

The default status is checked. User can modify it.

Set Point

The alarm thresholds are set here. This type does not support one high alarm, one low alarm mode. There is only one alarm level, Danger High. Alert set point is set to 0 always. When reverse rotation is checked, alert status is set. User can set the Danger high alarm according to the actual situation. The default GAP High is -24V ， GAP Low is -1V.

Leading Transducer

Be used to analyze the rotation direction.

Threshold Type

The default value is “Auto”. User could modify it.

For any other configuration setting, please refer to Speed.

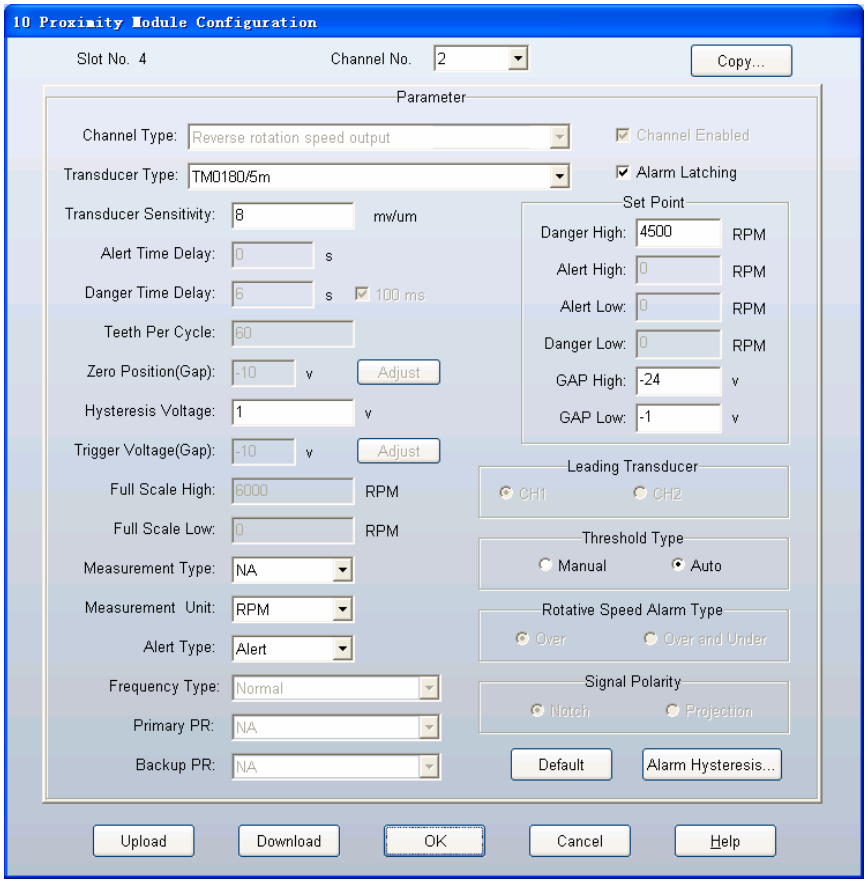


Figure 28

Transducer List

These are the transducers that can be connected to PT2060/10 PROX proximity module. For transducers not listed on this table, please consult ProvibTech before use.

<table>
<tr><th colspan="2">Transducer input</th><th>Module output</th></tr>
<tr><td rowspan="2">Proximity Transducer</td><td>TM0180/5m
TM0180/9m
TM0105/5m
TM0105/9m
TM0110/5m
TM0110/9m
3300/8mm/5m, 5mm/5m
3300/8mm/9m, 5mm/9m
7200/8mm/5m, 5mm/5m
7200/8mm /9m, 5mm/9m
3300/11mm/5m
3300/11mm/9m
7200/11mm/5m
7200/11mm/9m
Other 8mm Proximity probe transducer
Other 5mm Proximity probe transducer
Other 11mm Proximity probe transducer</td><td>Shaft vibration,
Shaft position,
Eccentricity output,
Low frequency Vibration,
Speed,
Zero speed ,
Reverse rotational speed</td></tr>
<tr><td>TM0120
Other 25mm Proximity probe transducer</td><td>Differential expansion</td></tr>
<tr><td>Magnetic pickup</td><td>TM0605</td><td>Speed</td></tr>
</table>

Note: do not use Magnetic pickup sensor to measure zero speed and reverse rotational speed channel type.

Module Control and Real-time Monitoring

PT2060/10 PROX modules are capable of collecting and processing signals from proximity probes, shaft vibration, shaft position, eccentricity, differential expansion, low frequency vibration, rotational speed, zero speed and reverse rotation speed. From the *PT2060 System Configuration* software the above signals can be monitored. The description in this chapter is based on PT2060 System Configuration. For more details, please refer to *PT2060 System Configuration* software user manual.

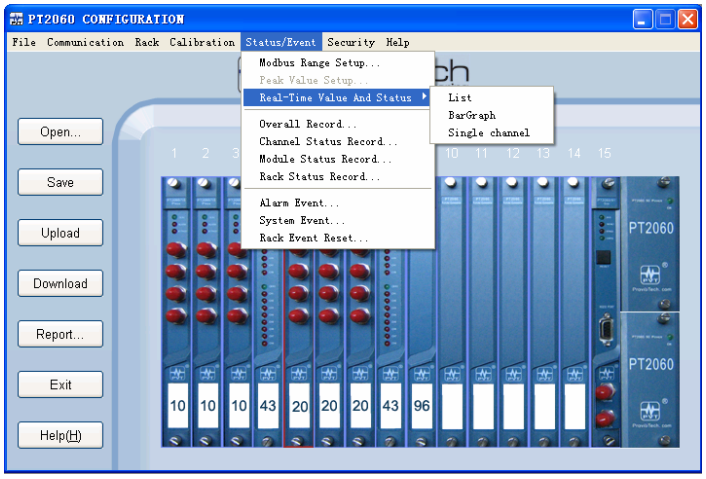


Figure 29

Above figure shows the main rack window of the software. Lots of work can be done by this software, such as calibrating, controlling and testing the PT2060/10 PROX modules.

When PT2060 is in RUN state, go into the real-time monitoring window from menu item "*Status/Event->Real-Time Value and Status*", as shown in the figure below.

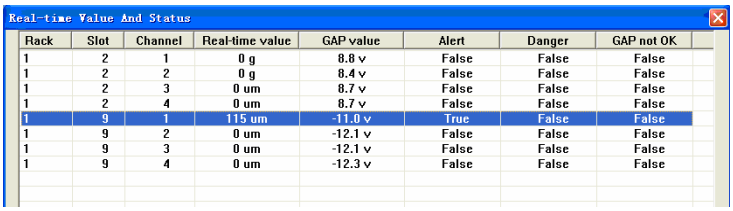


Figure 30

In the window *Real-time Value and Status*, real time value, gap voltage, alarm status, rack number, slot number and channel number are shown. And user could be clear at a glance of it.

Besides, PT2060/10 PROX proximity module saves history events and working status, including alarm events, system events, channel status records, module status records, and rack status records. See section "*Troubleshooting*" for details.

PT2060/10 PROX proximity module support alarm bypass, multiply alarm (valid for shaft vibration and low

frequency vibration) and self-test functions. Alarm bypass has two types, software bypass and hardware bypass. The multiply alarm is implemented through the software with a multiply terminal plugged. Self-test is fulfilled under the software control.

Hardware Module Operation

Besides software, PT2060/10 PROX modules can also provide messages of the monitored equipments. There are four BUF ports on PT2060/10-Front panel and four current output ports on PT2060/10-Back panel corresponding to its four channels. This figure greatly enhanced PT2060/10 PROX proximity module versatility. Users could obtain required signals from the module in the field.

Front Panel and Back Panel

PT2060/10-Front

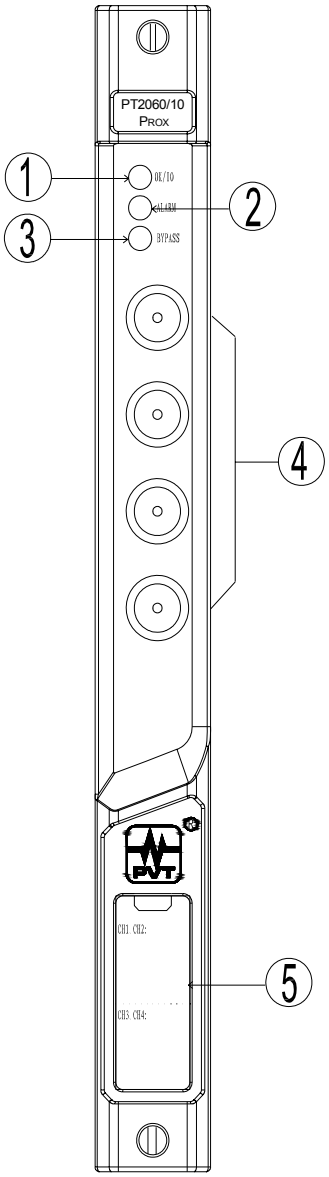


Figure 31

1. OK / IO LED
2. Alarm LED
3. Bypass LED
4. Buffered output

The four BNC connectors are corresponding to the output of the 1, 2, 3 and 4 channels. The buffered output will output the raw unfiltered sensor signal to portable data collector.

5. Channel label

Customer is able to mark channels on the label in the field. Label can be marked by remove the front plastic cover with a flat screw driver.

PT2060/10-Back

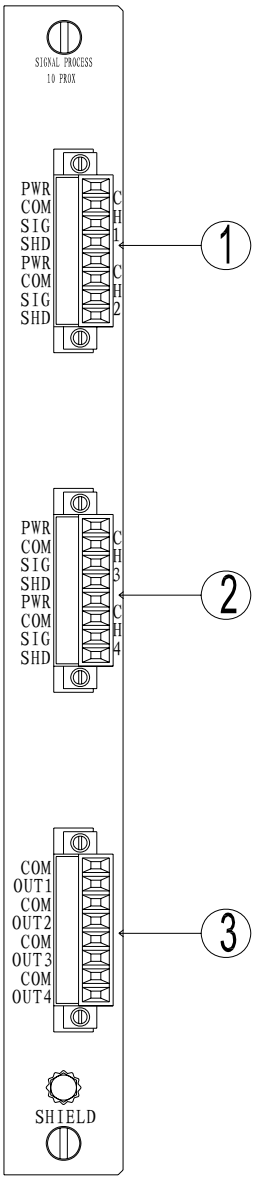


Figure 32

1. The terminal for sensor input of channel 1 and channel 2

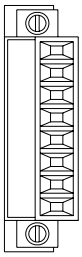


Figure 33

The screw on top and bottom are used to mount the connector. You may loose the screws, remove the connector, connect the cable and re-mount the connector.

2. The port for sensor input of channel 3 and channel 4

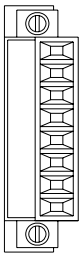


Figure 34

See description above.

3. 4-20mA output

As a standard feature, each channel has a 4-20mA output. The output is proportional to the full scale of each channel. It will drive the control systems directly. The maximum load is 300Ω.

Field-wiring Diagram

Field-wiring Diagram for all 5mm, 8mm and 11mm Probe Systems

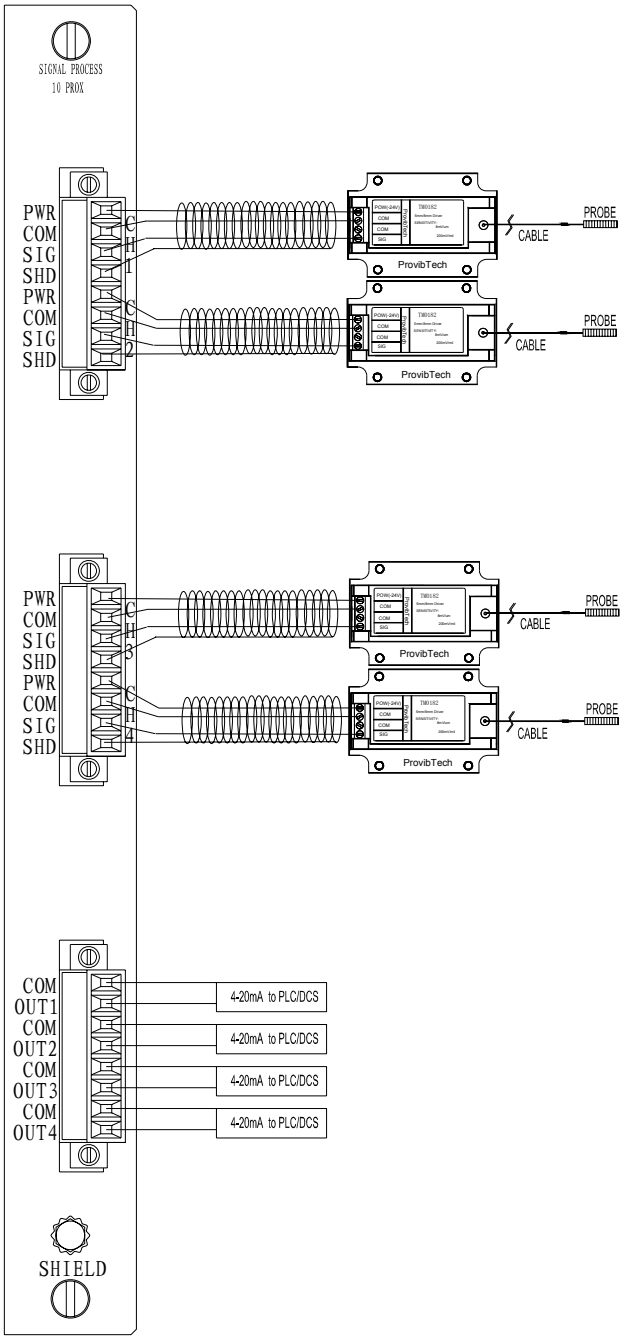


Figure 35

Field-wiring Diagram for 25mm Probe System

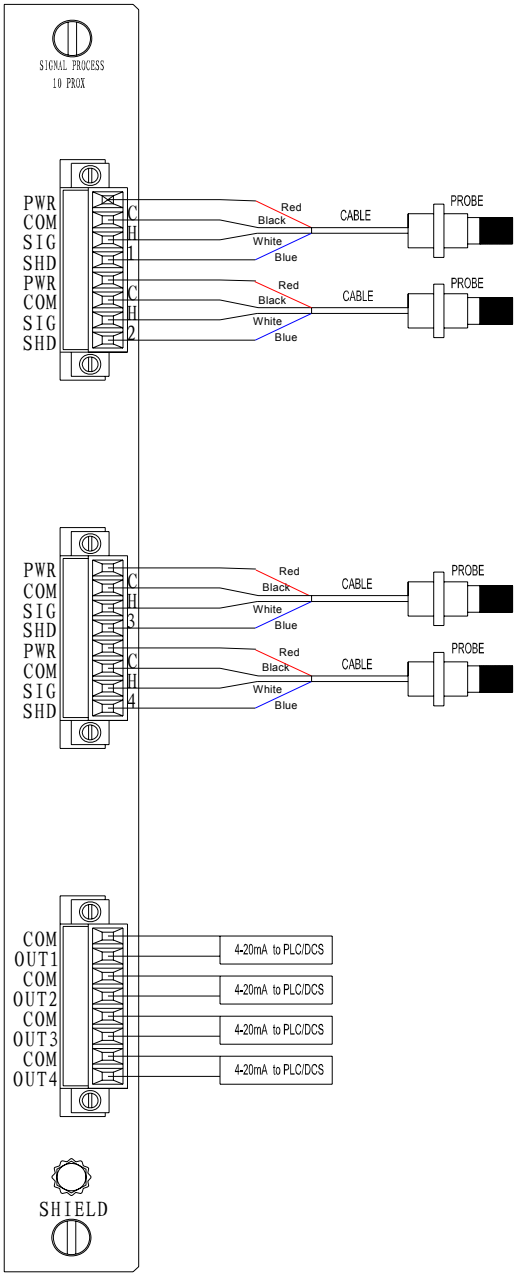


Figure 36

Field-wiring Diagram for Magnetic Pickup Systems

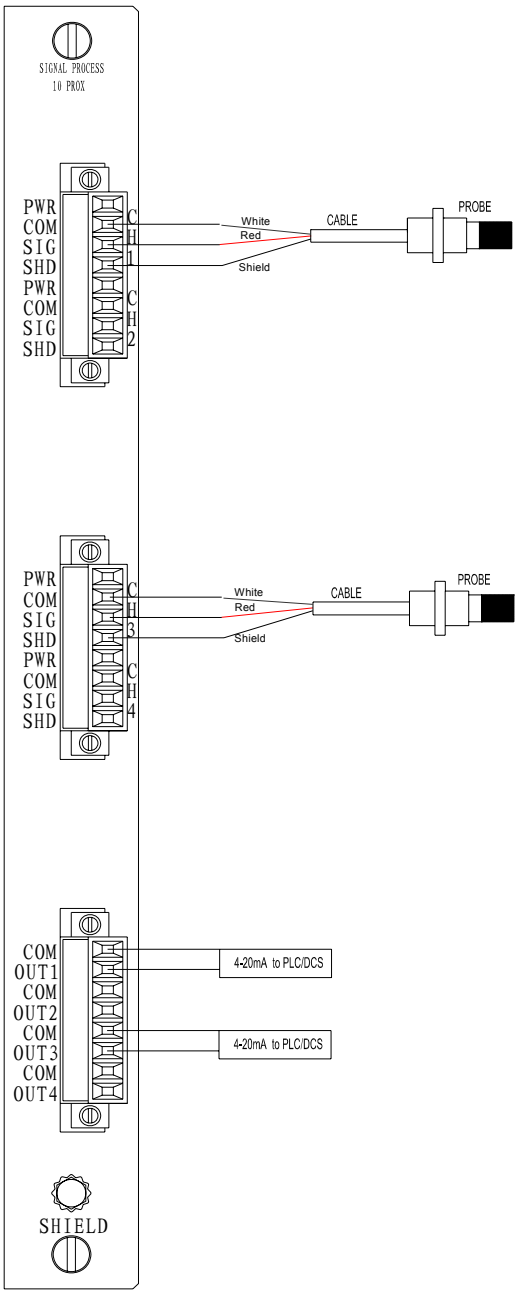


Figure 37

Field-wiring Diagram for Hazardous Area Application

TM0412 used as the barrier. For other barriers, please consult ProvibTech for tech support.

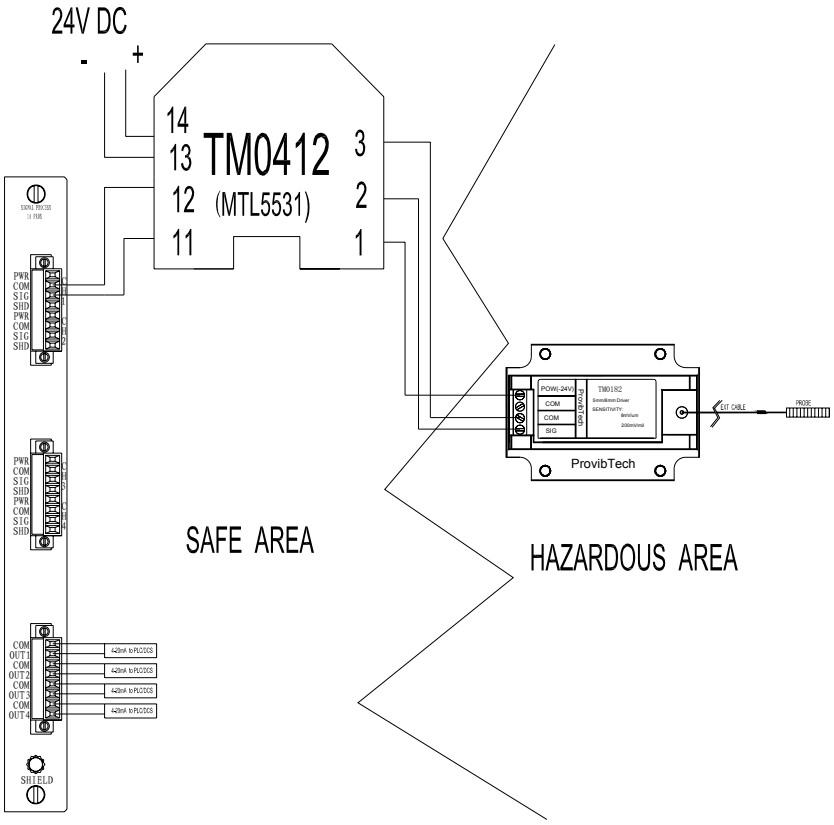


Figure 38

Field-wiring Diagram for Reverse Rotation Measurement and the Theory

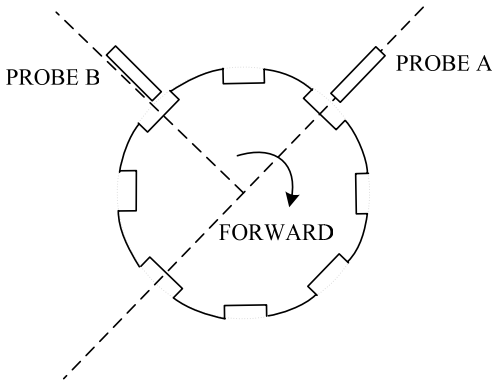


Figure 39

Reverse rotation measuring needs two proximity probes in pairs. The connection of each transducer to the PT2060/10 PROX proximity module is the same as described above. The probes may be mounted as shown in figure above.

Two probes are located in radial direction. The angle of the two probes may be adjusted according to the filed situation. Two probes must be mounted on the shaft with a distinction between them to make there are not interference between them.

After installing the two probes and connecting to PT2060/10 PROX proximity module, Power on the system. Choose which one is used as the criterion to estimate lead or lag of the signals via the software PT2060 system configuration. Refer to the relevant part of *Configuration Setting and Application* for operations.

Warning

The system has to be verified before running to determine the leading probe.
It is necessary to ensure the system working in forward rotation status. If it not, please exchange the two probes station or define the other channel as forward channel.

Module Maintenance

Instruction

User should not repair components inside a PT2060/10 PROX proximity module. The maintenance described here covers the test of the module and check whether it works properly. It also covers the linearity verification. But if the module behaves abnormal, user has to replace it by a new one.

This part describes how to check PT2060/10 PROX proximity module work status and calibrate output current in the following sections.

- ✓ Periodic maintenance
- ✓ Tool preparations
- ✓ Build of the maintenance environment
- ✓ Configuration software operating
- ✓ Module test
- ✓ Current calibrating
- ✓ Exceptional module treatment

Periodic Maintenance

This maintenance interval is very important for the module maintenance. Usually, a yearly maintenance is sufficient. If PT2060/10 PROX modules work in extraordinary circumstance, user should shorten the interval according to the actual situation.

Extraordinary circumstance means that

- ✓ PT2060 is used to monitor some critical equipment
- ✓ PT2060 works in high temperature, high humidity, and corrosive environment

Besides, maintenance interval should be adjusted according to plant maintenance period.

Preparation Work

Tool Preparations

The following instruments are needed for PT2060/10 PROX proximity module maintenance:

- ✓ Personal computer
- ✓ two digital multi-meters for voltage measure and current measure
- ✓ One signal generator (two, if phase reference is needed)
- ✓ One oscilloscope
- ✓ Some terminals and cable

Build of the Maintenance Environment

Typical maintenance environment can be built after these steps.

1. Make test terminals

Refer to appendix for the method to make terminals.

2. Make bypass terminal

Refer to appendix for the method to make terminals.

3. Make multiply terminal

Refer to appendix for the method to make terminals.

4. Install the software *PT2060 System Configuration* on a PC.
5. Connect PC serial port to PT2060 with a standard communication cable.
6. Power up. Upload all the modules' information. Save PT2060 configuration setting to a file, Power off the PT2060, demount it from the equipment and transfer it to a workbench.

Application Advisory
ProvibTech **recommends strongly** that the original configuration setting must be uploaded and saved before performing any modification to it and restore it after maintenance has been done!

7. Get the signal generator and the oscilloscope ready.
8. Get two multimeters ready.

Software Preparation

Get familiar with the software functions listed below before conduct the test.

- ✓ Upload, download, save configuration
- ✓ Enable/disable channels and alarm function
- ✓ Bypass channels alarm status
- ✓ Set channel multiply alarm
- ✓ Observe real-time value and alarm status

After powered on, Opening Configuration software the system will upload PT2060 configuration setting automatically. This could be done also by clicking the button *Upload*. After finishing setting parameters, click the button *Download* to send data to PT2060 or save to a file.

Click on the picture of PT2060/10 PROX proximity module to open parameter configuration window. At the right upper corner, there are check boxes "Channel Enabled" and "Alarm latching". Check them as need.

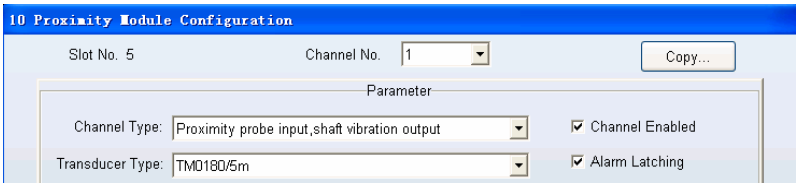


Figure 40

From the menu item *Rack->Signal Module Control* open the status control window where bypass and multiply alarms are specified. Click the button *Download* to send the setting to PT2060/10 PROX proximity module.

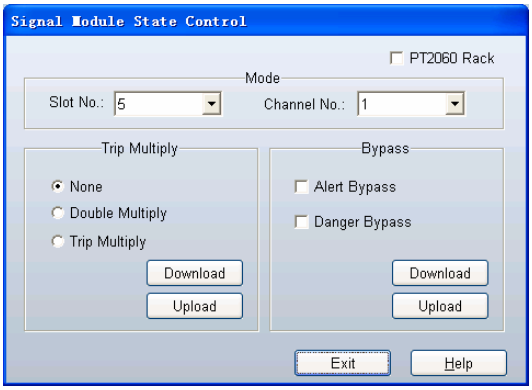


Figure 41

Module Test

A PT2060/10 PROX proximity module can accept signal from proximity probes only, no matter what type it works in (Shaft Radial Vibration, Axial Thrust Position, Differential Expansion, Eccentricity, Low Frequency Oscillation, Speed, Zero Speed, reverse rotation). The maintenance steps are all alike, except a bit difference in details.

⚠ Warning
High voltage! Contact could cause shock, burns, or death. Do not touch exposed wires or terminals.

Application Alert
Tests will exceed alarm set-point levels causing alarms to activate. This could result in a relay contact state change.

Application Alert
Disconnecting field wiring will cause a not OK condition.

Shaft Vibration

1. System construction

Determine the tested group, channel 1 and 2 for example. Plug the terminal into the port of channel 1 and 2 on the rear panel. Plug the black pen of a multimeter into port COM and the red pen of multimeter into OUT port, OUT1 for channel 1 for example. Set the multimeter to measuring direct current. Connect the positive pin

of the electrolytic capacitor (220μF/50V) of the terminal to a signal generator's output. Connect related BUF located on PT2060/10-Front panel to an oscilloscope. Connect phase reference terminal if necessary. Run the software *System Configuration*.

2. Test of powering on

On powering, OK / IO LED and Alarm LED should be on for 3s or so that indicates that the channel is operating correctly.

3. Test of communication

Click the button *Upload* on the software *System Configuration* main rack window to upload the parameters. If succeeded, please save these parameters to a file as the original data for recovery. If failed, please check communication cable and baud rate setting.

4. Test of parameter setting

Click on the picture of the tested module to open its configuration window where you could make some modifications. After that, you could download it and re-upload it again to compare whether they are changed correctly.

At the end you should restore all of the original setting.

5. Test of OK status

Observe the changing of OK / IO LED as you adjust the potentialmeter of the terminal plugged into the signal input terminal (It flashes only when all enabled channels on the module are OK). When the OK / IO LED went off, the output current is about 3.0 ±0.16mA which you could read from on the ampere meter

6. Test of linearity

Feed a channel with some certain magnitudes of signal at the frequency actually used in the field according to the following table. Measure the output current with an ampere meter. If the linearity does not satisfy the requirement, please re-calibrate it (refer to the next section).

Percentage of full scale	0%	25%	50%	75%	100%
4～20mA (mA)	4.00±0.16	8.00±0.16	12.00±0.16	16.00±0.16	20.00±0.16

Notes: Corresponding to the full scale 1000μm, the input signal should be at 8V/80Hz. If the current channel's full scale is 0-400μm, the signal given from the generator should be at 0-3.2V.

7. Test of alarm

Like the linearity test, provide a signal to channel 1 or 2, adjust the magnitude of the signal and observe the variation of alarm LED and check whether it light when any alarm threshold is broken and whether the variation of alarm status can be seen in *Real-time Value and Status* window.

If alarm latch is not set, the alarm will be reset as soon as the input signal is removed. Otherwise, it will be latched and can be reset only by pressing RESET button located on PT2060/91-Front panel (or clicking the menu item *Rack->Rack Reset Setup* of the software). Check whether it was reset from *Real-time Value and Status* window. Any channel's alarm of the module will light up the alarm LED and make the module change to alarm status. Besides, the alarm hysteresis also takes action in this process.

8. Test of BUF

If it is required, user could conduct BUF test. Adjust the input signal and check the buffered output with an oscilloscope whether they are compatible. Tune the potentialmeter to make its output at -10V or so and observe the buffered output with an oscilloscope. The noise signal PK-PK value should be less than 50mV.

The figure below shows how to connect an oscilloscope to BUF.

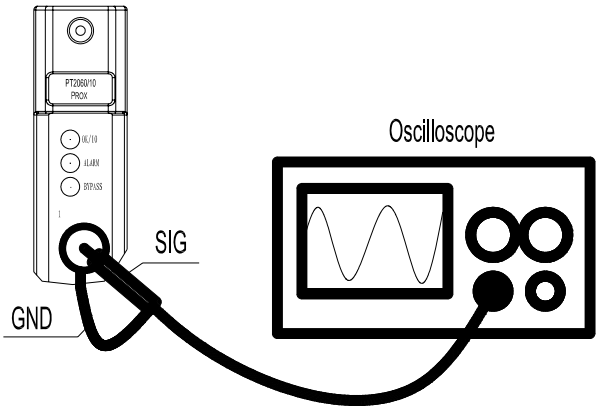


Figure 42

9. Test of software bypass

Checking the Channel Bypass switch will cause the module to indicate a "bypass" status. This feature should be used if you wish to temporarily disable a channel on a module. In *Signal Module status Control* window of the software, select slot number and channel number and tick Alert Bypass and/or Danger Bypass as you need. Download it by clicking the button *Download*. Supply a signal higher than alert or danger set-point at this hour and no alarm will occur, i.e. specified channel's alarm status is bypassed.

10. Test of hardware bypass

Feed a signal higher than alert or danger set-point to a channel. Plug the prepared bypass terminal in the socket located on the back panel of communication module. Bypass LED of the PT2060/10 PROX proximity module should light up and the Alarm LED should go off. Meanwhile, the alarm mark in the *Real-time Value and Status* window of the software vanishes. Unplugging the bypass terminal, the alarm reappears.

11. Test of multiply logic

In *Signal Module status Control* window of the software, select slot number and channel number and check none or Double Multiply or Triple Multiply as you need. Download it by clicking the button *Download*. Plug the prepared multiply terminal in the socket located on the back panel of communication module. Feed the channel with a signal. Merely when the magnitude of the signal is as high as double or triple of alert or danger threshold, the alarm occurs.

12. Test of voltage

Normal voltage is critical for measuring. Measure the channel voltage as shown in the figure below. It should be at about -24V for its normal operation.

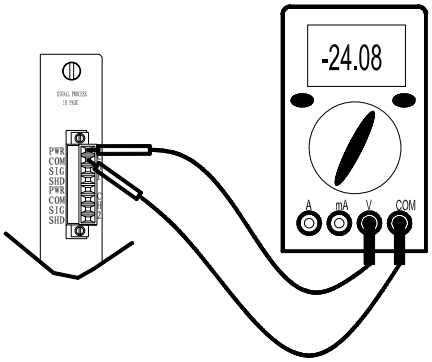


Figure 43

13. Test of redundant power

Feed channel 1 with a signal corresponding to 50% of Full-Scale. At this time, the output current of this channel is about 12.00±0.16mA. Pull out the lower power module and the output current should keep in this range. Push the lower power module and pull out the upper one, and the current should be stable too.

Shaft Position

1. System construction

The measuring of shaft position has no relation to phase reference, so the phase reference terminal and the signal generator are not needed. See shaft vibration for others.

2. Test of power on

See shaft vibration part.

3. Test of communication

See shaft vibration part.

4. Test of parameter setting

See shaft vibration part.

5. Test of OK status

See shaft vibration part.

6. Test of linearity

Tune the potentialmeter and check whether the current output suffices the linearity requirement according to the following table. If it does not, perform current calibration with the channel (see the next section).

Percentage of full scale	0%	25%	50%	75%	100%
4～20mA (mA)	4.00±0.16	8.00±0.16	12.00±0.16	16.00±0.16	20.00±0.16

Notes: When transducer direction is Toward Probe, corresponding to proximity probe's output voltage ranges of -2V and -18V. If the full scale is set to -1000μm and 1000μm respectively, then -2V corresponds with 1000μm and -18V corresponds with -1000μm.

7. Test of alarm

It should be paid more attention that there are four alarm levels for shaft position measuring mode. The signal is provided by tuning the potentialmeter.

8. Test of BUF

See shaft vibration part if it necessary.

9. Test of software bypass

See shaft vibration part.

10. Test of hardware bypass

See shaft vibration part.

11. Test of voltage

See shaft vibration part.

12. Test of redundant power

See shaft vibration part.

Differential Expansion

Its procedure is the same as the procedure of maintaining shaft position.

Eccentricity

1. System construction

Plug a phase reference terminal into the port located on PT2060/91-Back. Provide a signal with a prepared signal generator. Refer to the relevant part of PT2060/10 PROX proximity module Configuration Setting and Application and PT2060/10 PROX proximity module functions and configuration setting please. Conduct the test steps as what have done in shaft vibration test.

Notes: the electrolytic capacitor for this is 1000μF/35V. Merely channel 1 needs signal.

2. Tests of power on

See shaft vibration part.

3. Test of communication

See shaft vibration part.

4. Test of parameter setting

See shaft vibration part.

5. Test of OK status

See shaft vibration part.

6. Test of linearity

According to the assigned full scale and the frequency in the field, provide the first channel a signal with a function generator. The frequency of the phase signal is the same to that of signal generator. Adjust the amplitude of the signal and check the current output of the first channel, whether its linearity suffices the requirements listed in the following table. Adjust the potentialmeter and check the current output of the second channel whether its linearity suffices the requirements. If it does not, recalibrate it. (See the next section.)

Percentage of full scale	0%	25%	50%	75%	100%
4～20mA (mA)	4.00±0.16	8.00±0.16	12.00±0.16	16.00±0.16	20.00±0.16

7. Test of alarm

Like linearity test, provide a signal to channel 1. Adjust the magnitude of the signal. If channel 1 or channel 2 alarms, the alarm LED on the PT2060/10-Front should come on. The alarm status could be seen in *Real-time Value and Status* window.

If the alarm is not latched, the alarm status will reset as the signal is removed. Otherwise, it can be reset only by pressing the RESET button on PT2060/91-Front (or by clicking the software item *Rack->Rack Reset*

Setup). The alarm LED is to light up, when anyone of the channels turns to alarm status.
The alarm hysteresis also takes part in this.

8. Test of BUF

See shaft vibration part if it necessary.

9. Test of software bypass

See shaft vibration part.

10. Test of hardware bypass

See shaft vibration part.

11. Test of voltage

See shaft vibration part.

12. Test of redundant power

See shaft vibration part.

Low Frequency Vibration

An electrolytic capacitor of 1000μF/35V is used on the terminal for Low frequency vibration test. The test procedure is the same as the procedure for shaft vibration test.

Speed

1. System construction

If transducer type is anyone of proximity probes, take one proximity terminal. Plug the terminal into the PT2060/10-Back panel. Connect the red pen of an ampere meter to OUT pin of the current output port and connect the black pen to GND pin on that port. Set the ampere meter to measure direct current. Feed a signal to the channel through the positive pin of the electrolytic capacitor (220μF/50V) of the terminal. Connect an oscilloscope to the BUF.

If transducer type is magnetic pickup, take one magnetic terminal. Plug the terminal into the PT2060/10-Back panel. Connect the red pen of an ampere meter to OUT pin of the current output port and connect the black pen to GND pin on that port. Set the ampere meter to measure direct current. Feed a signal to the terminal. Connect an oscilloscope to the BUF.

Turn on the PC and invoke the configuration software.

2. Test of power on

See shaft vibration part.

3. Test of system communication

See shaft vibration part.

4. Test of parameter setting

This is related to the first channel only.

5. Test of OK status

See shaft vibration part.

If transducer type is one of proximity probes, tune the potentialmeter (10kOhm) of the terminal plugged in the first channel. Observe OK / IO LED status (it flashes only when all enabled channel are OK). When the potentialmeter is out of the assigned OK range, the OK / IO LED will go off. At this time, the output current is 3.0 ±0. 16mA.

If transducer type is magnetic pickup, the channel has no relation to OK / IO LED.

6. Test of linearity

PT2060/10 PROX proximity module speed measure is related to the first channel and the third channel only. Provide a signal to that channel according to the following table. Check whether its linearity suffices the requirement or not. If not, perform calibration again.

Percentage of full scale	0%	25%	50%	75%	100%
4～20mA (mA)	4.00±0.16	8.00±0.16	12.00±0.16	16.00±0.16	20.00±0.16

Notes: Provide a signal of magnitude of 8V and tune its frequency according to the full scale. If the full scale is 0-6000RPM and teeth per cycle is 1, the frequency range is 0-100Hz.

7. Test of alarm

Like the linearity test, feed channel 1 with a signal generator. If a channel becomes alarm status, the alarm LED on the PT2060/10-Front panel should come on. The alarm status could be seen in *Real-time Value and Status* window.

If the alarm is not latched, the alarm status will reset as the signal is removed. Otherwise, it can be reset only by pressing the RESET button on PT2060/91-Front panel (or by clicking the software item *Rack->Rack Reset Setup*). The alarm LED is on, when anyone of the channels turns to alarm status.

The alarm hysteresis also takes part in this.

8. Test of BUF

If necessary, users can perform BUF testing.

Tune the signal generator and monitor the BUF output with an oscilloscope which should be conformable with the input one.

If transducer type is one of proximity probes, adjust the potentialmeter to make it outputs a voltage of about -10V and check the BUF output noise which should be less than 50mV.

If transducer type is magnetic pickup, check the BUF directly, the output noise should be less than 50mV.

9. Test of software bypass

See shaft vibration part.

10. Test of hardware bypass

See shaft vibration part.

11. Test of voltage

See shaft vibration part.

12. Test of redundant power

See shaft vibration part.

Zero Speed

An electrolytic capacitor of 1000μF/35V is used on the terminal for zero speed testing. The test procedure is the same as the procedure for shaft vibration test. Parameter setting refers to zero speed type part.

Reverse Rotation

1. System construction

Insert vortex analog terminals to two reverse rotational channels in one group. Choose electrolysis capacitance 220μF/50V. Use two multimeters to measure current, connect the red pen of the multimeter to OUT pin, black pen to GND pin of current output terminal. Tune the multimeter to measure direct current.

Supply signal through the positive pole of electrolytic capacitor 220μF/50V on the terminal(measure tool). Connect oscillograph to BUF terminal.

2. Test of system power on

Refer to speed part.

3. Test of communication

Refer to speed part.

4. Test of parameter configuration

Channel 1 and 2 need to be set simultaneously. Refer to reverse rotation part.

5. Test of OK status

Refer to speed part.

6. Test of linearity

According to full scale and the frequency in the field, provide the module two signals which have the same frequency and different phases, as shown in the figure below.

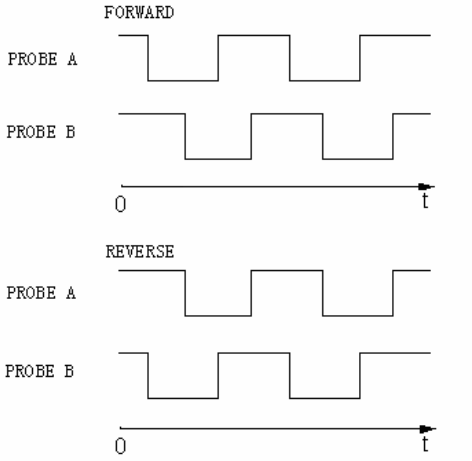


Figure 44

Make sure that the Leading transducer is CH1, which means that the rising edge of the signal of the first channel is used as criterion.

If the signals provided to channel 1(Probe A used as the sensor) and 2(Probe B) are like the FORWARD in the figure above, at this time, the rising edge of the first channel is leading to that of the second. If the Teeth per cycle is set to 60, the real-time value of the first channel equals to the signal frequency and the output current is its proportional value. The second channel shows zero and outputs a current of 4mA. While keeping the phase relation of the signals, adjust their frequency to verify the linearity, check whether it is satisfied.

If the rising edge of the second channel is leading to that of the first, as the above REVERSE figure shows, the target rotates reversely. If the teeth per cycle is set to 60, the real-time value of the second channel equals to the signal frequency and the output current is proportional to the value. The first channel shows zero and outputs a current of 4.0mA. While keeping the phase relation of the signals, adjust their frequency to verify the linearity, check whether it is satisfied.

Linearity and Percentage of full scale comparision Table.

Percentage of full scale	0%	25%	50%	75%	100%
4～20mA (mA)	4.00±0.16	8.00±0.16	12.00±0.16	16.00±0.16	20.00±0.16

Notes: The amplitude of the provided signals is normally 8V. Change the frequency as per full scale and teeth. If the full scale is set to 0-100RPM, teeth is set to 60, the signal frequency is within the range of 0-100Hz. If the Leading transducer is set to CH2, it means the rising edge of the second channel is used as criterion. The other functions are unchanged except alarm status.

7. Test of alarm

Like the test of linearity, provide signals to channel 1 and 2. When any alarm threshold is met or exceeded, watch the alarm LED whether it is on, verify whether the alarm status can be seen from *Real-time Value and Status* interface of the software.

If the alarm is not latched, the alarm status is reset after the provided signal has been removed. Otherwise, it can be reset only by pressing the *RESET* button (or clicking "*Rack->Rack Reset Setup* item). Watch the status alternation from *Real-time Value and Status* interface of the sofware.

This part has also relation to alarm hysteresis.

8. Test of BUF

Refer to speed part.

9. Test of software bypass

Refer to speed part.

10. Test of hardware bypass

Refer to speed part.

11. Test of voltage

Refer to speed part.

12. Test of redundant power

Refer to speed part.

4-20mA Output Calibration

User should not repair the components inside PT2060/10 PROX modules. However, if the linearity of some channels does not satisfy the requirement according to the test result conducted as described above, user could re-calibrate these channels.

4-20mA Current calibration, follows these steps.

1. Connect a multimeter to the current output port in serial. Plug Red pen into OUT and black pen into COM.
2. Click menu item *Calibration->User Calibration* and enter password to open calibration window. See the following figure. Select the slot number and channel number to be calibrated.

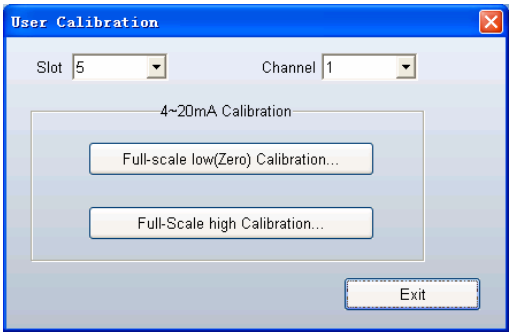


Figure 45

3. The whole procedure is implemented in the 4-20mA Calibration.

Click the button *Full-scale low(Zero) Calibration* to open the zero calibration window(figure 46). Follow the steps showed in the window to implement calibration. First, click the button *Start Calibration* in step1. Then read the output current value from multimeter after it settled down. Enter this value (three significant decimal digits) into the text area in step2. After that, click the button *Full-scale low Calibration* in step3 to download. Wait till the multimeter outputs a right value, click Exit to exit the zero calibration.

Figure 46

4. Click the button *Full-scale high Calibration*. Click OK button in the WARNING window(figure 47). Enter YES in the Warning dialogue (figure 48) and click OK to open the calibration window(figure 49). Follow the steps showed in the window to implement calibration. First, click the button *Start Calibration* in step1. Then read the output current value from multimeter after it settled down. Enter this value (three significant decimal digits) into the text area in step2. After that, click the button *Full-scale high Calibration* in step3 to download. Wait till the multimeter outputs a right value, click Exit to exit the high calibration.

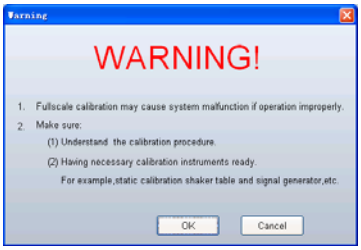


Figure 47

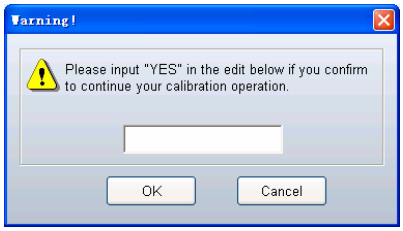


Figure 48

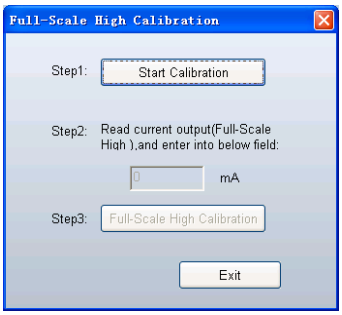


Figure 49

5. Click the button *Exit* to go back to the run state. You could optionally do linearity test again to check the calibrating result. If you does not satisfy, you could redo it.

Exceptional Module Treatment

In case of finding some exceptions after the test, except the linearity problem which can be solved by calibrating, users should not repaire it by themselves. Users could substitute it with a spare PT2060/10 PROX proximity module and contact with a ProvibTech local office.

Troubleshooting

Assessing PT2060/10 PROX proximity module status and troubleshooting in operations by analyzing the status of LED, System event list, Alarm event list are described in this chapter.

LED

LED located on the PT2060/10-Front panel are OK / IO LED, Alarm LED, and Bypass LED. They directly indicate the PT2060/10 PROX proximity module working status. If something abnormal, user could analyze it and solve some problems.

OK / IO LED

Flash: All enabled channels are ok. Digital communication is ok.
On without flash: All enabled channels are ok. No digital communication. This means there are problems in communication.
Off: One or more channels are not ok.

If OK / IO LED went off, the reasons may be: one or more channels' GAP voltage is out of range; the connection of some transducer or the transducer itself is broken; If the first is the case, when it turns from GAP not OK to OK status, there is a 15s delay for real-time value, alarm, 4-20mA current output. Try these to solve the problem: remount the module, reset it; check the probe and cable.

Alarm LED

On: One or more channels have alarms. When the alarm type is Alert, the alarms can be either alert or danger or both. When it is GAP, the alarms can be either GAP or danger.
Off: All channels on the module are in normal status. No alarms engaged.

If Alarm LED does not work normally, it may be caused by these: the module is failed; the transducer and the cable. Try these to solve it: remount the module; reset it; check the probe and cable.

Bypass LED

On: PT2060 is in hardware Bypass mode. All alarms on this module are inhibit from alarms (no alarms will be engaged). Module's real-time value and current outputs are not affected.
Off: Normal operation mode. If it does not light after bypass terminal inserted, the bypass led does not work normally.

If Bypass LED does not work properly, it may be caused by these: PT2060/10 PROX proximity module or PT2060/91 SIM System Interface module is in an abnormal condition. In this case, please contact with a ProvibTech local office.

Real-time Value and Status

From *Rea-time Value and Status* window, as shown in the following figure, user may unveil some problem.

Alert

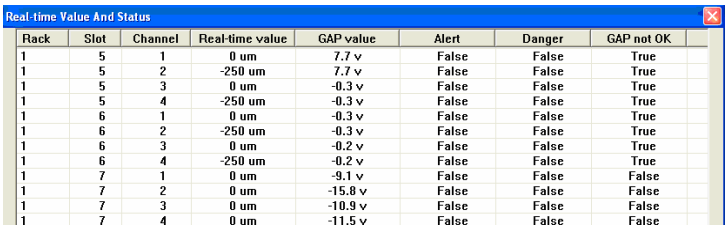
False: When alarm type is Alert, it means there is no alert. When alarm type is GAP, it means there is no GAP alarm.
True: When alarm type is Alert, it means there is an alert. When alarm type is GAP, it means there is a GAP alarm.

Danger

False: It means there is no danger alarm no matter what alarm type is.
True: It means there is a danger alarm no matter what alarm type is.

GAP not OK

False: The channel is OK.
True: The channel is GAP not OK. The reasons may be: a. the sensor's GAP is out of range; b. the connection may fail; c. the sensor is damaged. If the reason is a, there will be a delay of 15s, when it turns from GAP not OK to OK status.



Rack	Slot	Channel	Real-time value	GAP value	Alert	Danger	GAP not OK
1	5	1	0 um	7.7 v	False	False	True
1	5	2	-250 um	7.7 v	False	False	True
1	5	3	0 um	-0.3 v	False	False	True
1	5	4	-250 um	-0.3 v	False	False	True
1	6	1	0 um	-0.3 v	False	False	True
1	6	2	-250 um	-0.3 v	False	False	True
1	6	3	0 um	-0.2 v	False	False	True
1	6	4	-250 um	-0.2 v	False	False	True
1	7	1	0 um	-9.1 v	False	False	False
1	7	2	0 um	-15.8 v	False	False	False
1	7	3	0 um	-10.9 v	False	False	False
1	7	4	0 um	-11.5 v	False	False	False

Figure 50

System Event List

The System event list of PT2060/10 PROX proximity module could be seen in the *PT2060 System Configuration* software. This list contains the recent 500 events.

Click menu item *Status/Event->System Event* of the software to open a new window like the figure below.

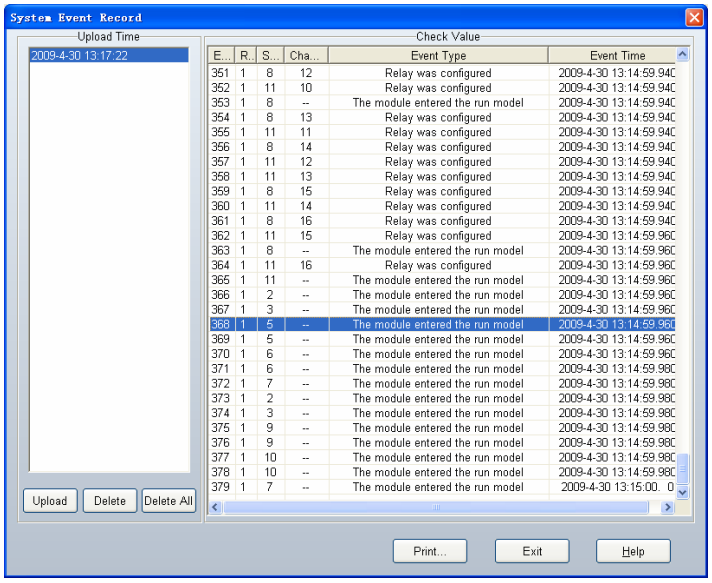


Figure 51

Click the button *Upload* at left-bottom corner of the window to obtain the new System events. In the left area, there is a list of upload time which is the time you perform an upload from PT2060 rack. Click one of these items to get its detail event list in the right field. Event without channel number means it does not concern any channel. Take the highlighted line in figure above for example, the PT2060/10 PROX proximity module in slot 5 entered run status sometime. By browsing this event list, you will be able to know what happened recently. It may help the user to solve some problems.

If you could not solve the problem by yourself, please save these message for our service staff.

Alarm Event List

Like System event, the software deals with alarm event list in the same way. It also keeps 500 recent alarm events.

Click menu item *Status/Event->Alarm Event* of the software to open a new window like the figure below.

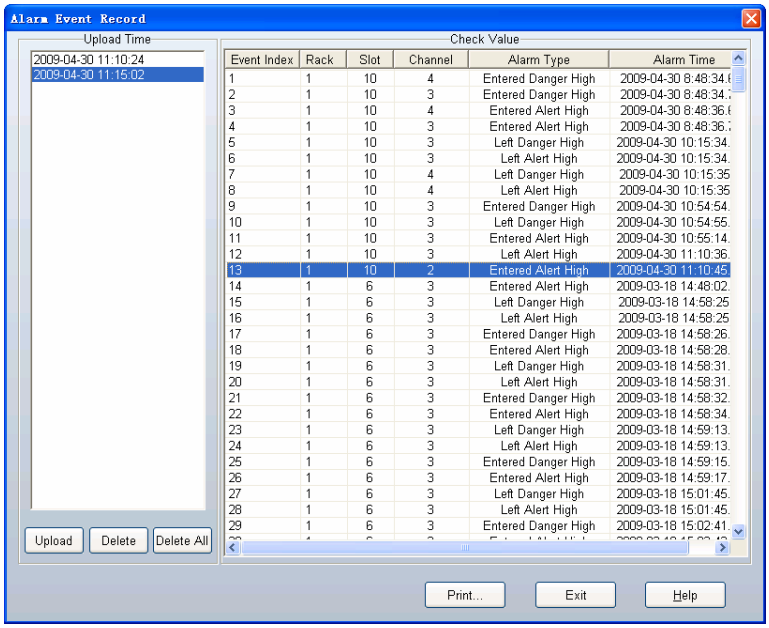


Figure 52

Click the button *Upload* at left-bottom corner of the window to obtain the new Alarm events. In the left field, there is a list of upload time which is the time you perform an upload from PT2060 rack. Click one of these items to get its detail event list in the right field. Take the highlighted line in the figure for example, the PT2060/10 PROX proximity module in slot 10 entered alarm status at 11:10:45 in the day 04/30/09. By browsing this event list, you will be able to know what happened recently. It may help you to solve your problem.

If you could not solve the problem by yourself, please save these message for our service staff.

Exceptional Module Treatment

If any problems are discovered in the above test, please contact with a ProvibTech local office.

Additional Information

Ordering Information

Each PT2060/10 PROX proximity module consists of two boards, PT2060/10-Front and PT2060/10-Back.

PT2060/10-AX:

AX: Back-panel IO module

A0: Basic IO module

Optional Accessories

There are several accessories for selecting:

PT2060-001000: PT2060/10 Front panel

PT2060-001001: PT2060/10 Back panel

Examination

The encapsulation of PT2060 can protect modules from all kinds of damage. As soon as the reception, user should examine the conducts whether it is damaged and whether it is caused by transportation. Please contact the carrier, if it happened.

If no damage is found and the system does not work properly, please check the user manual first. If the problem can not solve, please contact the closer ProvibTech office.

Factory Default Configuration

When user purchases PT2060/10 PROX modules, please appoint the module type according to ordering information described above. Besides, a detailed instruction is also needed. If user does not give the details, the modules would be configured with the following setting mainly and delivered to the buyer.

Proximity Probe Input, Shaft Vibration Output

Channel Type: Proximity probe input, shaft vibration output

Transducer Type:	TM0180/5m	Channel Enabled:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked
Alert Time Delay:	3s	Danger High:	175μm
Danger Time Delay:	1s	Alert High:	125μm
Full Scale High:	250μm	GAP High:	-19v
Full Scale Low:	0μm	GAP Low:	-1v
Measurement Type:	PK-PK		
Measurement Unit:	μm		
Alert Type:	Alert		

Proximity Probe Input, Shaft Position Output

Channel Type: Proximity probe input, shaft position output

Transducer Type:	TM0180/5m	Channel Enabled:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked
Alert Time Delay:	3s	Danger High:	700μm
Danger Time Delay:	1s	Alert High:	500μm
Zero Position (GAP):	-10v	Alert Low:	-500μm
Full Scale High:	1000μm	Danger Low:	-700μm
Full Scale Low:	-1000μm	GAP High:	-19v
Measurement Type:	AVERAGE	GAP Low:	-1v
Measurement Unit:	μm	Transducer Direction:	Toward Probe
Alert Type:	Alert		

Proximity Probe Input, Differential Expansion Output

Channel Type: Proximity probe input, differential expansion output

Transducer Type:	TM0120	Channel Enabled:	checked
Transducer Sensitivity:	0.8mv/μm	Alarm Latching:	checked
Alert Time Delay:	3s	Danger High:	3.5mm
Danger Time Delay:	1s	Alert High:	2.5mm
Zero Position (GAP):	-6v	Alert Low:	-2.5mm
Full Scale High:	5mm	Danger Low:	-3.5mm
Full Scale Low:	-5mm	GAP High:	-12v
Measurement Type:	AVERAGE	GAP Low:	-0.5v
Measurement Unit:	mm	Transducer Direction:	Toward Probe
Alert Type:	Alert		

Proximity Probe Input, Eccentricity Output

Channel 1/3

Channel Type: Proximity probe input, eccentricity output

Transducer Type:	TM0180/5mm	Channel Enabled:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked
Alert Time Delay:	3s	Danger High:	175μm
Danger Time Delay:	1s	Alert High:	125μm
Full Scale High:	250μm	GAP High:	-19v
Full Scale Low:	0μm	GAP Low:	-1v
Measurement Type:	PK-PK		
Measurement Unit:	μm		
Alert Type:	Alert		

Primary PR: Phase reference channel 1

Backup PR： NA

Channel 2/4

Channel Type: Proximity probe input, eccentricity output Channel Enabled: checked

Transducer Type:	TM0180/5mm	Alarm Latching:	checked
Transducer Sensitivity:	8.0mv/μm		
Alert Time Delay:	3s	Danger High:	175μm
Danger Time Delay:	1s	Alert High:	125μm
Zero Position (GAP):	-10v	Alert Low:	-125μm
Full Scale High:	250μm	Danger Low:	-175μm
Full Scale Low:	-250μm	GAP High:	-19v
Measurement Type:	AVERAGE	GAP Low:	-1v
Measurement Unit:	μm		
Alert Type:	Alert		

Proximity Probe Input, Low Frequency Vibration Output

Channel Type: Proximity probe input, low frequency vibration output

Transducer Type:	TM0180/5mm	Channel Enabled:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked
Alert Time Delay:	6s	Danger High:	150μm
Danger Time Delay:	6s	Alert High:	100μm
Full Scale High:	250μm	GAP High:	-19v
Full Scale Low:	0μm	GAP Low:	-1v
Measurement Type:	PK-PK		
Measurement Unit:	μm		
Alert Type:	Alert		

Speed Output

Channel 1/3

Channel Type: Speed output

Transducer Type:	TM0180/5mm	Channel Enabled:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked
Teeth per Cycle:	1	Danger High:	4500RPM
Hysteresis Voltage:	1v	Alert High:	3000RPM
Full Scale High:	6000RPM	GAP High:	-24v
Full Scale Low:	0RPM	GAP Low:	-1v
Measurement Unit:	RPM	Threshold Type:	Auto
Alert Type:	Alert	Rotative Speed Alarm Type:	Two Levels
		Signal Polarity:	Notch

Zero Speed Output

Channel 1/3

Channel Type: Zero speed output

Transducer Type:	TM0180/5mm	Channel Enabled:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked

Teeth Per Cycle:	1	Alert Low:	66RPM
Hysteresis Voltage:	1v	Danger Low:	33RPM
Full Scale High:	100RPM	GAP High:	-24v
Full Scale Low:	0RPM	GAP Low:	-1v
Measurement Unit:	RPM	Threshold Type:	Auto
Alert Type:	Alert	Rotative Speed Alarm Type:	Two Levels
		Signal Polarity:	Notch

Channel 2/4

Channel Type: Zero speed output

Transducer Type:	TM0180/5mm	Channel Enable:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked
Teeth per Cycle:	1	Danger High:	4500RPM
Hysteresis Voltage:	1v	Alert High:	3000RPM
Full Scale High:	6000RPM	GAP High:	-24v
Full Scale Low:	0RPM	GAP Low:	-1v
Measurement Unit:	RPM	Threshold Type:	Auto
Alert Type:	Alert	Rotative Speed Alarm Type:	Two Levels

Reverse Rotational Speed Output

Channel 1/3

Channel Type: Reverse rotational speed output

Transducer Type:	TM0180/5mm	Channel Enabled:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked
Teeth per Cycle:	1	Danger High:	4500RPM
Hysteresis Voltage:	1v	Alert High:	3000RPM
Full Scale High:	6000RPM	GAP High:	-24v
Full Scale Low:	0RPM	GAP Low:	-1v
Measurement Unit:	RPM	Leading Transducer:	CH1
		Threshold Type:	Auto
		Rotative Speed Alarm Type:	Two Levels
		Signal Polarity:	Notch

Channel 2/4

Channel Type: Reverse rotational speed output

Transducer Type:	TM0180/5mm	Channel Enable:	checked
Transducer Sensitivity:	8.0mv/μm	Alarm Latching:	checked
Teeth per Cycle:	1	Danger High:	4500RPM
Hysteresis Voltage:	1v	GAP High:	-24v
Full Scale High:	6000RPM	GAP Low:	-1v
Full Scale Low:	0RPM		
Measurement Unit:	RPM	Threshold Type:	Auto

⚠ Warning
If measurement type is not specified, PT2060/10 module's channels are configured in Proximity probe input, shaft vibration output by default.

Appendix

There is some information about making Test Terminals.

Terminal for Proximity Probe

If the channel is to connect with a proximity probe, the terminal should be made following these steps.
Take an 8 pin plug (centre distance 3.8mm) as shown in the figure below. Solder the movable pin of a potentialmeter of 10kΩ and the negative pin of an electrolytic capacitor of 200μF/50V or 1000μF/35V together and then connect it to the SIG pin of the plug. Connect the other two pins of the potentialmeter to PWR and COM respectively. Left the positive pin of the electrolytic capacitor float through which the signal will come in.

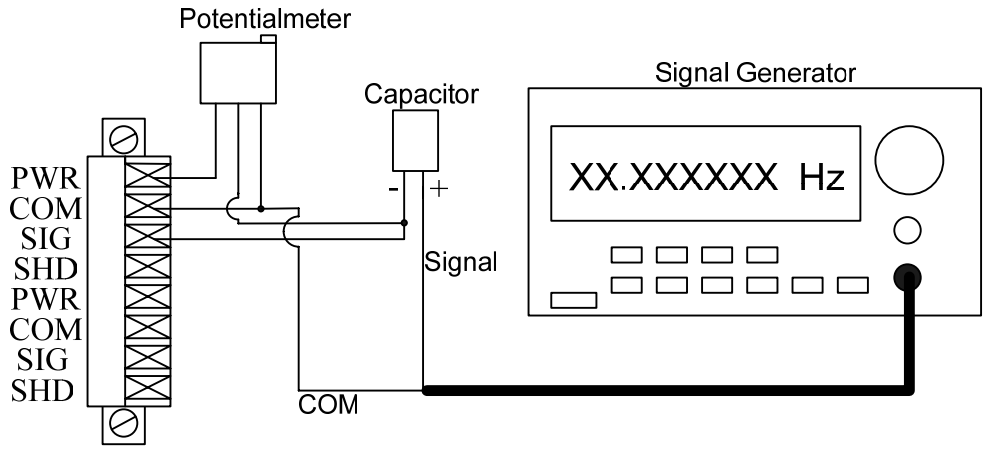


Figure 53

Terminals for Magnetic Pickup

Take an 8 pin plug (pin distance 3.8mm) like what is shown in the figure above and two short wires. Connect one wire to SIG, and other wire to COM.

Phase Reference Terminal

If the channel needs phase reference signal, the terminal should be made following these steps.
Connect the movable pin of a potentialmeter to the PH-REF1 pin of a pin plug (pin distance 3.8mm). Solder the negative pin of an electrolytic capacitor to the movable pin of the potentialmeter. Connect the other two pins of the potentialmeter to -24V pin and COM pin. When the phase reference is needed, feed a signal to the float positive pin of the electrolytic capacitor. In the manual trigger mode, the phase signal magnitude should be greater than 0.5V(PK-PK）and above 1 RPM(0.017Hz). User can select trigger voltage from -17~-3V; in the auto trigger mode, the signal magnitude should be greater than 2V(PK-PK) and above 120 RPM (2 Hz).

Bypass Terminal

Take a six pin plug (pin distance 3.8mm), and short RST_BY and GND pins according to the label on PT2060/91-Back.

Multiply Terminal

Take a six-pin plug (pin distance 3.8mm), and short ALM_MU and GND pins according to the label on PT2060/91-Back.